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## LECTURE II.*

THE evidence I have to offer as to the importance of the respiratory efficiency of the individual is based upon results obtained upon flying officers. Modern service flying, particularly in time of war, imposes a great stress upon the airman; it became important, therefore, to devise simple tests which besides helping to elucidate the causes of flying strain, would aid in the efficient selection of suitable candidates for flying. Various considerations soon led me to the point of view that in many cases of flying strain the first breakdown in the bodily system was probably in connexion with the respiratory mechanism, which became defective in working, reacted unfavourably upon the efficiency of the circulatory and nervous systems, and thereby brought out signs of cardio-vascular or nervous debility. To test this point an examination was made of the respiratory systems of successful pilots (chosen by the executive), of pilots in need of rest but not of medical treatment, and of pilots broken down by stress and requiring medical attention.

### NATURE AND VALUE OF THE TESTS EMPLOYED.

It is not proposed to give here the full results of such examinations, many of which have been reported elsewhere.[1] Rather will be given illustrative examples to show the value of the tests employed. In regard to the final form which these tests have taken, it is pointed out that they were designed to act as adjuncts to the clinical examination and therefore had to be of a simple character, to require but little apparatus, and to be capable of easy application. It is further pointed out that the success of the use of such tests depends upon the exactness with which the technique is carried out; otherwise results of but little comparative value are obtained. In the first place were measured the vital capacity and the power to hold the breath after full inspiration and full expiration. At the same time investigations were made on the tidal air, on the composition of the alveolar air before and after holding the breath, and on the susceptibility of the subject to diminution of oxygen-tension by letting him breathe in and out of a five-litre bag, the carbon dioxide being absorbed. With further work the importance of efficient expiratory capacity was indicated by a number of observations, as, for example, by the fact that pilots suffering from strain could not blow round rapidly the dial-hand of the modified gas-meter employed for measuring the vital capacity; although this instrument offered but little resistance, the endeavour made such subjects flushed and out of breath.

In consequence the test for expiratory force was devised. For a time observations were also made on the power to draw up mercury by an inspiratory movement—but these were early found to be of little value, and were abandoned, since it was difficult to rule out the "sucking power" of the individual as distinct from "inspiratory force." Later the supplemental air was determined by asking the subject to breathe in quietly and out quietly as in normal respiration, and then to blow his reserve of air through the meter. The complemental air was determined by a reverse process—namely, after a quiet inspiration the sucking in of as much air as possible through the meter. Owing, however, to the difficulty of cleansing the tubes, &c., the determination of the complemental air was abandoned as unhygienic. It was found, however, that unlike the supplemental air, the complemental air was not affected, except possibly in one case of extreme fatigue.

### SPECIAL ROUTINE TESTS.

Measurement was also made of the time during which the subject could, after full expiration and full inspiration, sustain a column of mercury at 40 mm. with the breath held and nose clipped, the pulse being counted during the process. By a comparison of the results obtained the following tests came into routine use in the Royal Air Force, as affording information of value: (1) Vital capacity; (2) holding the breath; (3) expiratory force; and (4) sustaining 40 mm. mercury (endurance or fatigue test).

These tests were employed in conjunction with tests for circulatory efficiency and nervous stability. For the former were employed: (1) The pulse-rate sitting, after standing up, and after regulated exercise (lifting the body-weight on to a chair five times in 15 seconds), and (2) measurement of the systolic and diastolic arterial pressures. For the latter were employed the tests introduced by Mr. Arthur Cheatle: (1) Observation of knee-jerks and other reflexes; (2) observation of presence or absence of tremor of eyelids, tongue, and fingers; (3) observation of the ability of the subject to stand steadily on one leg for 15 seconds with eyes closed and hands to side; and (4) the ability of the subject to raise from table to shoulder level and replace again an unstable rod placed on a piece of board.

The technique laid down for the special tests referred to above is as follows:—

1. *Vital Capacity.*—The candidate sits opposite the spirometer, the dial being so placed that he cannot see the readings. Neck, chest, and abdomen must move freely. With the nose clipped he is directed to fill his lungs to their maximum capacity, and then to expire as completely as possible at a fair rate through the meter. Several mouth-pieces must be kept in disinfectant and the mouth-piece changed for each candidate. Preferably five observations should be taken and recorded in litres and fractions of a litre.

2. *Breath-holding.*—The candidate is asked to expire audibly as deeply as possible and then to fill the lungs fully (but not to absolute distension) and to hold the breath with the nose clipped. The reason for the audible expiration is that it has been observed that some subjects suffering from stress have lost the power of expiring fully, and a marked shortening of time taken to expire as fully as possible may afford an indication of such loss of power. The time for which the breath is held is noted, and the candidate is then asked the reason for giving up. This should be recorded. The candidate must not be told the significance of the test, nor the time he is expected to hold his breath. On no account may he time himself. The demeanour of the candidate during the test is noted, also the degree of discomfort endured and the amount of resolution displayed.

*Reason for Ceasing.*—Normally an answer such as "I had to give up," "I felt I should burst," "I wanted to breathe," is given. Subjects suffering from marked disability at altitudes almost invariably return an abnormal answer—e.g., "I became giddy or dizzy," "Things went blurred," "The blood rushed to my temples," "I began to feel squeamish." Where the answer is deemed not to be normal the candidate's own words should be given.

3. *Expiratory Force.*—The candidate is instructed to hold his lips around the mouth-piece with the thumb and fore-finger of each hand, at the same time pressing against the cheeks so that these take no part in the performance of the test. After drawing in a full inspiration through the nose, he is told to blow the mercury steadily as high as possible, being sure to work the abdominal musculature during the process. On no account must the candidate be allowed to swing the mercury up violently, and in all cases the height of any initial swing is to be disregarded. The reason for holding the cheeks is that it has been found that in some cases the mercury may be forced up to abnormal heights by the action of the cheek muscles. The number of mm. Hg blown is recorded. The first test is made with the scale turned away. The candidate is then asked to repeat the performance while looking at the column. The resolute candidate may, under these conditions, considerably exceed the effort which he did not see, in this way affording some indication of his mental make-up. On the other hand, a

* Lecture I. was published in THE LANCET of Sept. 17th, p. 593. Lecture III. will appear in a coming issue.

subject who is not trying may give very discrepant readings. With the manometer again turned away, he may, by encouragement, be made to surpass his previous efforts, but when, after trying again whilst looking at the manometer scale, he will, if he is not really trying, not surpass the previous effort which he saw.

4. *Sustaining 40 mm. Hg (endurance or fatigue test).*—This test is performed as follows: the candidate is asked to empty the lungs, fill up, blow the mercury to the height of 40 mm. and hold it there without breathing for as long as possible, the nose being clipped. An essential adjunct to this test is the behaviour of the pulse, which is counted for every five seconds during the time that the mercury is sustained. As in the breath-holding test, the demeanour of the subject, the discomfort endured, and the resolution displayed are noted.

Before passing to a consideration of the results obtained it is necessary to consider each test in more detail and, if possible, to meet certain criticisms which may be made. As already indicated, the prime idea of such tests is to provide adjuncts to the clinical examination and not to carry out experiments of absolute accuracy with elaborate scientific apparatus requiring a difficult technique.

### *Vital Capacity.*

The employment of a modified gas meter is open to the criticism that it opposes a resistance to the breathing out and gives inconstant readings. The resistance of a meter of good make is not large, but it is true that it is difficult to obtain a dry meter which gives accurate readings; the error to a steady rate of breathing out can be obtained by periodic testing. Mosso was apparently the first to use such an instrument in preference to the spirometer designed by John Hutchinson[2] and modified by various subsequent observers. Since the pioneer work of Hutchinson, much as been written as to the clinical value of the measurement of the vital capacity. One of the severest criticisms as to its value has been the great difficulty experienced by various observers in laying down what is to be regarded as the normal for any one individual. It is probably on this account that spirometry has not come into more general use. During the years (1846–1855) following the pioneer work of John Hutchinson, there was much work done upon the vital capacity of both males and females, and considerable discussion arose as to what factors should be taken into account in determining the normal standard. The literature for this period is given by Arnold.[3]

John Hutchinson considered the standing height as the principal factor determining the vital capacity, and worked out values based mainly upon this measurement. He found that the sitting height was of little value for this purpose. He considered that the vital capacity was also influenced by weight in relation to height, and also by the degree of mobility of the chest. He did not find any direct relationship between the circumference of the chest and the vital capacity. He states that the vital capacity is influenced by the bodily position in which it is taken, chiefly through altered mobility of the ribs, being greater standing than sitting; sitting than lying. It is influenced by age, increasing up to 35 and then decreasing to 65, and by sex, being greater in males than females. The taking of food modifies the vital capacity. Hutchinson found that the vital capacity varied with the occupation of the individual, being greatest in seafaring folk and military recruits, medium in police and firemen, low in sedentary workers.

Simon (1848) made observations upon the vital capacity. He set his standards by the standing height and gave figures which were somewhat smaller than Hutchinson's. He also made observations upon the influence of sex, but no observations on the effect of weight or age. He found that the capacity was influenced by the mobility of the chest as measured by upper chest expansion.

Fabius (1853) from his observations came to the conclusion that the standards for vital capacity could best be calculated from the sitting height and chest circumference. He found also that the mobility of the chest and the age of the individual had to be considered. He formed the opinion that a good deal depended upon the muscularity of the individual, the vital capacity being greatest in strong individuals, since they can breathe in and out more than weak men. He believed that the taking of food and constipation considerably diminished the capacity. He states that the administration of one ounce of lenitive electuary increased the vital capacity of his assistant by 250 c.cm. He found that the vital capacity was not decreased by pregnancy.

Wintrich (1854) made observations on 3500 healthy individuals, including 500 women, ranging from 6 to 90 years of age. He fixed his standards by the standing height, age, and sex. He found that consideration of the weight was of no practical value. He noticed also that in strong people the effect of bodily position was slight, but was striking in weak people. He found no effect on vital capacity as the result of pregnancy.

Schneevogt (1854) examined 300 healthy and diseased individuals particularly as regards the relationship between vital capacity and standing height, sex, and age.

Arnold (1855) reviewed the whole position and made many further observations upon his own account. He came to the conclusion that the vital capacity increases with the standing height. He could not agree that the measurement of the sitting height was of greater value than that of the standing height. He considered that the measurement of the chest circumference is one of value, particularly if a reduction of 5 cm. to 10 cm. be made for fat subjects and an addition of 5 cm. be made for thin ones. Weight was to be considered only in so far as it was influenced by height. He found a lessened capacity of 100–200 c.cm. after meals. He did not attribute importance to the degree of upper chest movement, believing that chest movement increases with height rather than with chest circumference. He therefore made different allowance for expansion at various heights. Age had a definite effect, but he found that the true value of age influence could not be sufficiently accurately determined. Arnold worked out figures for women; finding the vital capacity absolutely and relatively smaller than in man, he also found the measurement of chest circumference of less value than in man. He found no diminution as the result of pregnancy.

Despite Hutchinson's and Arnold's work spirometry did not come into general use—probably, as has been indicated, owing to the fact that it was found difficult to lay down an exact standard for an individual. From time to time observations of various authors have been published, but no attempt will be made to deal with such observations here.

In more recent years Bohr [4] has shown that the residual air of the lungs is increased during muscular exercise and that the vital capacity is correspondingly decreased—giving, as it is termed, a greater mid-capacity between the breaths. This is probably to allow more efficient circulation through the more distended lung during the period of exercise. On the other hand, it is obvious that the residual air cannot be increased above a certain amount without seriously affecting the efficiency of lung ventilation.

More recently Peabody and Wentworth [5] have again graded healthy individuals, both male and female, according to height. They give the figures shown below.

| | Height. | Vital capacity. |
|---|---|---|
| Males .. .. | 6′ and over | 5100 |
| | 5′ 8½″ to 6′ | 4800 |
| | 5′ 3″ to 5′ 8½″ | 4000 |
| Females.. .. | 5′ 6″ and over | 3275 |
| | 5′ 4″ to 5′ 6″ | 3050 |
| | 5′ 4″ or less | 2825 |

They also show that the vital capacity is a function of the surface area, as calculated by Du Bois's formula.[6]

Dreyer (1919)[7] has applied the measurement of the vital capacity to the assessment of physical fitness. He finds the older methods of estimating the vital capacity inadequate, since they were based on the theory that definite relationships exist between age, height and weight, relationships which he believes do not exist. He publishes tables of the vital capacity based upon calculations from definite relationships which he shows to exist between the weight of the body, the sitting height, and the chest circumference. Full details are to be found in his recently published book on this subject.[8]

*Vital Capacity during Disease.*—In regard to the vital capacity during disease, Hutchinson pointed out the value of measurement in phthisis. He divided his cases into two classes, early and late. In the early stages he looked upon a diminution of 16 per cent. as suspicious, believing that unless the person examined was excessively fat he was probably the subject of disease. In late cases the deficiency may well amount to 2000 c.cm. or more. Various observers [3] (1846–1855) confirmed the value of spirometry in this respect (Simon, Fabius, Wintrich, Arnold, &c.). Wintrich believed that phthisis could be ruled out if the vital capacity was only diminished by 1/6, but believed that a positive diagnosis even without other signs could be made with a diminution of 1/5–1/4 the normal vital capacity. Arnold believed spirometry was of value not only in diagnosis but also in

estimating the degree of infection, pointing out that it is of particular value when no other signs can be found as enabling correct early treatment to be adopted. Recently Dreyer and Burrell (1920)[9] have again drawn attention to the value of spirometry in connexion with the early diagnosis of phthisis.

Observations as regards vital capacity were made in a number of other conditions—e.g., bronchial catarrh, acute pneumonia, empyema, emphysema, asthma, hypertrophy of liver and spleen, ascites, scrofula, &c. (for literature see Arnold).[3] Generally speaking, it may be said that the vital capacity was found to be diminished in all diseases in which the airways become filled with secretions, and in conditions in which the lung is compressed. In emphysema the vital capacity is diminished, particularly in relation to chest circumference (Arnold).

Bohr [4] has shown that the residual air is increased in emphysema, the mid-capacity of the lung being increased. Siebeck [10] has confirmed this and shown that a similar condition appertains in decompensated heart cases, an observation also made by Rubow.[11]

Peabody and Wentworth[5] have shown that cases of heart disease, which become dyspnœic more readily than healthy subjects, suffer from a diminished vital capacity. They find that this diminution accords well with the clinical condition. They regard the dyspnœa as being due to the inability of such cases to increase the depth of respiration in normal fashion. In their opinion, any condition which limits the possibility of increasing the volume of air breathed per minute is a very important factor in causing the production of dyspnœa. They express the opinion, therefore, that the determination of the vital capacity offers a clinical test as to the functional efficiency of the heart, since compensated cases who do not suffer from dyspnœa have a normal vital capacity according to their method of calculation.

In my experiments the measurement of vital capacity was used in conjunction with other tests to see whether any functional relationship existed between such tests in successful and unsuccessful officers. With respect to fixing a standard it has to be borne in mind that in the earlier days of the war officers engaged in flying were, generally speaking, not chosen below a certain height and standard of physique, owing to their inability to manipulate machines, nor above a certain height and weight, owing to their inability to accommodate themselves to the relatively small machines and to the undesirability of having heavy individuals for flying purposes. With the first measurements it soon became obvious that officers who could not fly high possessed a small vital capacity compared to those who were successfully carrying on. This was particularly marked in those who were suffering from flying strain; in such the vital capacity was found to be what might be termed absurdly small, often from 2500 c.cm. to 3000 c.cm. instead of approximately 4000 c.cm. usually found in the fit flying officer. It is to this falling away of the vital capacity as a result of exposure to strain that I wish to draw particular attention. Having discovered its existence I endeavoured to find out where exactly the discrepancy lay by taking observations of the tidal air, complemental, and supplemental air. At first I tried to make relatively accurate experiments by means of prolonged observations with a mask and inspiratory and expiratory valves. It was found that the wearing of a mask tended to alter the breathing of the subjects, and it was difficult to overcome the resistance of the valves. Moreover, subjects suffering from strain did not care about such apparatus and sometimes objected to its use. For the measurement of the complemental and supplemental air, therefore, it was found simpler to ask the subjects to endeavour to breathe as fully as possible after making a normal quiet inspiration or expiration. After about 20 observations I satisfied myself that there was little or no falling away on the inspiratory side—the complemental air averaging in all between the standard figures of 1500–2000 c.cm. or over. On the other hand, the measurement of the supplemental air gave results which showed that in officers suffering from strain the supplemental air is generally decreased, especially in those who have been engaged for a long period in high flying (21,000 feet), in whom it may measure no more than 500–800 c.cm. Further observations quickly confirmed the view that in officers suffering from strain the diminution of the vital capacity was due to their inability to expire sufficiently to empty the lungs to their full capacity. This was confirmed also by the observations that it was difficult for such officers to blow forcibly through the spirometer, or to blow up a five-litre bag. I do not think attention has been drawn to this point before, but it is undoubtedly one of considerable importance. The fit individual is possessed of a good vital capacity because he has the power adequately to empty his lungs by expiration. This power also is not greatly reduced by bodily strain. In the unfit individual bodily strain does affect the capacity. The diminution of the vital capacity of an individual leads to deficient ventilation of the lungs and accounts for the condition which I have observed in tired pilots, and which has also been recorded by Corbett and Bazett[12]—namely, that instead of responding to muscular effort by an increased depth of respiration they quickly become breathless and pant in short ineffective gasps as the result of exercise. Officers themselves are aware that they now easily get out of breath on the ground, while in the air they begin noticeably to breathe deeply at altitudes at which previously they were unaffected, so far as they themselves had noticed. Observations made upon candidates who have never flown have convinced me that such respiratory inefficiency is not confined to the flying officer. It is quite common to meet among candidates for aviation individuals whose respiratory capacity is small. Such candidates have usually led sedentary lives and indulged but little in health-giving exercise.

The case may be stated briefly as follows. The normal fit individual is possessed of sufficient expiratory force to keep his residual air near the physiological minimum (say, 1000 c.cm.). In the unfit person, owing to lack of good expiratory tone, the vital capacity becomes decreased and the residual air increased, with the result that the ventilation capacity of the individual is greatly decreased. This can be seen by a consideration of the following figures: Suppose a fit man has a vital capacity of 4000 c.cm. (ventilation capacity of 4 to 1); when as the result of strain or unfitness his vital capacity is reduced to 3500 c.cm. his residual air increases to 1500 c.cm., and his ventilation capacity is now only 2¼ to 1; a reduction of the vital capacity to 3000 c.cm. and an increase of the residual air to 2000 c.cm. gives a ventilation capacity of 1½ : 1, instead of 4 : 1. As already stated, such vital capacities were frequently found and observation showed that they increased with treatment, rest, and exercise. I have had many examples of this. Recently I saw a flying officer who, on his return from Egypt after a considerable period of high flying followed by strain, had at his first examination a vital capacity of 2200 c.cm. Six months later, as the result of rest and exercise, it had increased to 5600 c.cm.

In my next lecture I shall give other examples of the increase of vital capacity by special expiratory exercises. Not only is an increased residual air a disadvantage when exercise is taken, but when the body is resting a large residual air necessitates a greater inspiration to bring about adequate ventilation of the lungs. It appears quite probable that after a time ventilation becomes relatively inadequate, so that an anoxæmia in the arterial blood results, the respiratory and other centres in consequence becoming more sensitive to stimulation by the $CO_2$ tension of the arterial blood. It may even be that in certain cases the $CO_2$ tension of the arterial blood is increased; Poulton and Campbell[13] have found that this condition occurs in cases of heart disease and it appears possible that a similar state of affairs may be found in unfit people who are respiratorily deficient in the way I have described. Such a state would readily explain the reason of the breathlessness on exertion, and the greater susceptibility to diminishing oxygen-tensions in the lung (see Table I.). It would also conduce to a hyperexcitability of the central nervous system generally.

TABLE I.

| Initials. | Breath held. | Alveolar air after full expiration and full inspiration. | | Alveolar air after holding breath. | | Oxygen percentage content of bag at breakdown. | Time of breathing in and out of bag. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| | Secs. | $CO_2$ % | $O_2$ % | $CO_2$ % | $O_2$ % | | Secs. | |
| F. T. W. .. | 72 | 5·40 | 15·32 | 6·65 | 10·95 | 7·99 | 200 | Fit. |
| T. G. .. .. | 70 | 5·63 | 16·29 | 6·61 | 12·30 | 6·35 | 255 | ,, |
| J. A. C. .. | 68 | 4·54 | 16·30 | 7·19 | 10·10 | 5·00 | 280 | ,, |
| C. A. .. .. | 78 | 4·66 | 16·37 | 6·36 | 13·33 | 8·78 | 230 | Fit (slight stress). |
| A. S. C. .. | 53 | 4·24 | 16·01 | 5·31 | 13·54 | 9·03 | 150 | Tired. |
| O. G. L. .. | 54 | 5·14 | 15·00 | 6·25 | 11·60 | 12·15 | 190 | Nervous headaches. |
| J. A. W. .. | 38 | 4·83 | 16·41 | 6·00 | 13·41 | 12·11 | 130 | Fainted in air. |
| F. J. M. .. | 36 | 4·14 | 17·20 | 6·18 | 14·33 | 13·14 | 132 | ,, ,, |
| T. A. C. .. | 53 | 4·16 | 16·01 | 6·18 | 12·97 | 14·69 | 125 | Dizziness in air. |
| L. G. B. .. | 32 | 5·49 | 14·22 | 5·77 | 12·08 | 13·00 | 124 | Ditto after accident. |
| T. C. N. .. | 36 | 5·00 | 15·92 | 5·5 | 13·62 | 13·75 | 150 | Unfit. |
| S. O. S. .. | 32 | 5·42 | 15·53 | 6·60 | 12·46 | 13·52 | 90 | Unfit; headaches.* |

* After concussion in motor accident.

In addition to the measurement of the vital capacity, therefore, I prefer also to use in conjunction tests such as the breath-holding and 40 mm. Hg test, in which the performance of the individual depends upon the amount of the air contained within the lungs (vital capacity + residual air). It is to be anticipated that when the vital capacity is small and the residual air increased the performance will be poor, and conversely, when the vital capacity is large and the residual air minimal the performance will be good; I believe the above-mentioned tests prove this to be the case.

*The Breath-holding Test.*

The idea underlying this test primarily was that it would serve to give an idea of the subject's susceptibility to unpleasant sensations as the result of diminution of the oxygen-tension in the alveolar air. It was shown by Leonard Hill and the writer [14] that if a subject be asked to hold his breath, not knowing whether he has filled his lungs with air or with oxygen, the breath is held about two to two and a half times as long when oxygen is breathed in, as compared with the result when the lungs are filled with air. It was argued, therefore, that a man who could hold his breath long, until the alveolar oxygen-content was low, would probably be able to endure more easily the diminished oxygen-tension of high altitudes than one who more quickly suffered discomfort as the oxygen-tension was reduced.

By analysis of samples of the alveolar air taken by Haldane and Priestley's method at the beginning and at the end of the test it was found that certain subjects (found unfit) manifested signs of great discomfort with considerably less diminution of oxygen than did others who were fit. This is seen in the figures given in Table I., which are examples taken from observations made on 47 subjects. It was found that unfit subjects could not expire so forcibly as fit, and therefore that the true alveolar content might not be obtained, especially in taking the sample immediately after holding the breath. That there is such an increased susceptibility, however, especially to diminution of oxygen, was confirmed by observations made by breathing in and out of a five-litre bag, the carbon dioxide being absorbed. It was found that some subjects suffered discomfort when the oxygen percentage in the bag was reduced only to about 12 to 13 per cent., whereas others did not suffer until the oxygen percentage was reduced to 7 or 8 per cent. By calculation from this percentage a rough estimate of the height at which discomfort would supervene could be ascertained. For example, taking 16 per cent. as the oxygen-content of normal alveolar air at 760 mm. then a bag content of 11·5 per cent. corresponded to $\frac{760 \times 11{\cdot}5}{16} = 546$ mm. Hg = 9000 feet approximately as compared with a bag content of 8 per cent. which equalled 380 mm. Hg, or approximately 19,000 feet. It was found that this method provided useful information as to the height at which symptoms would develop and that it correlated well with the breath-holding test.

As already stated, the nature of the answer returned during the breath-holding test is important, the normal individual does not suffer from unpleasant sensations such as dizziness, giddiness, or nausea. The man unfit for flying was frequently found to be able to hold his breath but a short time and to give an abnormal answer as shown in Table II. As the result of experiment on successful officers chosen by

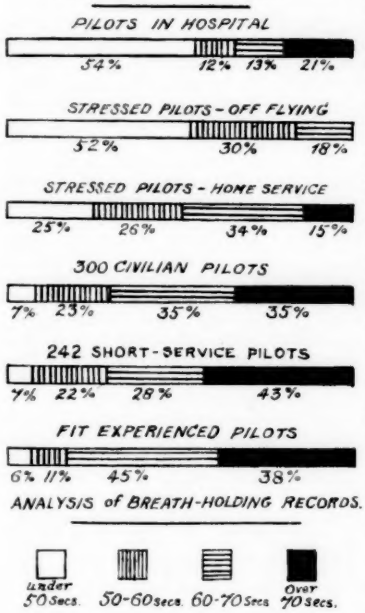
TABLE II.

| Initials. | Vital capacity in c.cm. | Breath held in secs. | Remarks after holding breath. | Number of hours flying. | Remarks. |
|---|---|---|---|---|---|
| E. .. .. | 2400 | 25 | Made him fuzzy. | 10¼ (dual) | Giddiness and blurring of vision when flying at 6000 ft. Bag method broke down at 6000 ft. |
| Bo... .. | 3800 | 19 | Head inclined to swim. | 6 (dual) | Has fainted three times below 5000 ft. With bag method nearly fainted at 3000 ft. |
| H. W. A. .. | 3750 | 34 | Headache and throb. | 16 (solo) | Headaches—worse after one hour; has had concussion. By bag method, "oxygen-want" at 4000 ft. |
| P. S. M. .. | 3700 | 36 | Little dizzy; warm in head. | 30 | Goes dizzy and sick in air with bag method. Broke down at 4000 ft. |
| D. W. S. .. | 3500 | 21 | Sort of funny. | 2 (solo) | Dizzy every time he went up. |
| H. G. G. .. | 3700 | 40 | Head bursting, especially at temples. | P.U.I.* | Bad pressure in head and discomfort, especially about 2000 ft. |
| S. B. M. .. | 2800 | 30 | Felt little giddy. | Just got wings. | Feels giddy and faint above 5000 ft. By bag method broke down at 4500 ft. |
| J. B. .. | 3300 | 21 | Little giddy. | 8 | Giddy above 1000 ft. |
| E. W. C. .. | 3200 | 26 | Uneasy. | 25 | Solo, feels faint over 2000 ft. By bag method broke down at 8500 ft. |
| V. P. J. .. | 2700 | 15 | Blood rushing to temples visible. | P.U.I.* | Gets headache and blood rushing to temples at 2000 ft. Was stood off flying; now permanently unfit pilot. |
| G. W. .. | 3200 | 20 | Pressure in head and temples. | Just got wings. | Above 5000–6000 ft. pressure in head and temples; blurring of vision. With bag method broke down at 5000 ft. |
| G. N. .. | 3200 | 35 | Queer in head. | P.U.I.* | Giddy during first flight; with bag method broke down at 4500 ft. |

* P.U.I. = pupil under instruction.

the executive the normal time was fixed at 69 seconds approximately; in the tired pilots the time was found to be 51 seconds; in pilots who had to be taken off flying for flying strain, 49 seconds. Besides giving indication as to the likelihood (when the time is short and an abnormal answer is given) of the subject suffering from oxygen-want at altitudes, the breath-holding test may also be taken to give indication as to the stability of the respiratory centre to diminished oxygen-tension. Experience with the test shows that great instability of this centre is also accompanied by instability of the vaso-motor and coördinated centres and may also, in many cases, reflect instability of the nervous system generally. The test is also of psychological value, since observation of the subject during the test gives an indication of the resolution with which he will carry on under conditions involving gradually increasing discomfort. The value of the breath-holding test in aiding in an assessment of flying capacity is indicated by the following chart (Fig. 1). The fit experienced pilots numbered 52 and were chosen by the executive; the short-service pilots had suffered from no disability in the air and were anxious to obtain short-service commissions; the civilian pilots had flown on an average 800 hours, had suffered from no disability in the air, and were applying for licence to carry passengers and goods. The stressed pilots (home service) were returning from active service overseas and were tired but not in need of medical treatment, whereas, the stressed pilots (off flying) were being treated in hospital or performing ground duties only. The pilots in hospital were not selected and, although for the most part suffering from strain, included subjects who were suffering from temporary illness such as influenza or conditions requiring surgical treatment. This accounts for the percentage (21 per cent.) who could hold their breath the normal 70 seconds or over. (Fig. 1). The next figure indicates that among 79 pupils who qualified but broke down from medical causes, including acute infectious diseases, within one year of acceptance, breath-holding on the small side. From actual experience it is known that those who fail medically display a small breath-holding capacity at the time of failure. The figures indicate that there is ground for the view that it is advisable to admit candidates with a breath-holding capacity approximating to that of the fit flying officer as selected by the executive and to give special consideration before admittance to those whose breath-holding capacity approximates to that of the tired or broken-down pilot (Fig. 2).

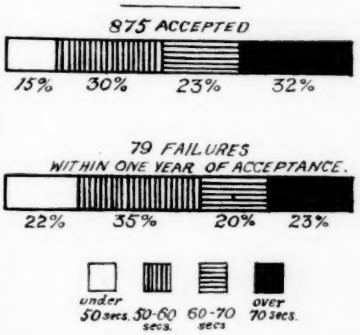
FIG. 1.




*The Test for Expiratory Force.*

At the time that this test was first employed in the examination of the flying officer I did not know that John Hutchinson[2] had already used the test. As the result of his observations John Hutchinson expressed the opinion that "a dynamic instrument like the hæmodynamometer would be useful to those whose duty it is to examine men for certain public services, as for the army, navy, police, fire-brigade, &c.; with care it would often detect disease." Hutchinson was of the opinion that measurement of the inspiratory power was more valuable than that of the expiratory power, which he found more apt to vary. It is to be noted that he measured such forces through the nostrils. In this connexion I must observe that I also tried this method, but found that I had to give it up owing to the discomfort induced in many subjects, who objected most strongly to this form of the test. For this reason, therefore, the method of performing the test in which movement of the lips and cheeks is prevented is still used, and despite criticism on the point, it is on the whole satisfactory. That is to say, that it is desirable that the expiratory force in man shall at least reach the minimum standard of 80 mm. Hg, preferably the average of 110 mm. Hg, otherwise a cause should be sought for the inefficiency, and, generally speaking, it may be assumed that bodily endurance is not likely to be good. In regard to Hutchinson's conclusion as to the superiority of the inspiratory force, it is interesting to note that this was formed on account of the greater variability of this power. In my opinion, it is this great variability which lends value to the test for expiratory force. Hutchinson's figures for Freeman the giant show that, as he became more and more ill with phthisis, his expiratory force declined more than did his inspiratory; there was a decline of 38 mm. Hg in the former from 127 to 89 mm. Hg and of 60 in the latter (160–100 mm. Hg). I have noticed that my own expiratory force is greatly lessened by an attack of "influenza," and returns to normal as my physical condition improves. Hutchinson gives the variation of expiratory force from 50–250 mm. Hg, observing that it was high in the Thames police, sailors, firemen, and pugilists, less in paupers and gentlemen, low in pressmen, and lowest in compositors. It was also low in cases of disease. The various values which I have found in regard to this test are given later, the standard for fitness being set upon specially selected officers.

FIG. 2.

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(*This lecture will be concluded in our next issue.*)

# ON THE VALUE OF APPARATUS AND TECHNIQUE IN MEDICAL RESEARCH.[1]

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IN all inquisition into the causation of pathological events, and into the efficacy of treatment—in other words, in all medical research—adjudication by empirical methods—i.e., by observation unaided by apparatus and technique—should be superseded by adjudication undertaken with the help of apparatus and technique.

### *What Empirical Methods Promise.*

Empirical methods take cognisance only of what comes, without our going in quest of it, into our field of experience; and they take into account only that knowledge which is brought to us directly by our five senses. In other words, in empiricism we have that which unregenerate man most desires: an evangel which proscribes all delving below the surface of things, all going in quest of knowledge, all employment of apparatus, and all troublesome technique—in short, a gospel which holds out promise of knowledge unpurchased by arduous labour.

In reality the promise that is held out is merely deceptive. It is quite true that so long as inquiry is confined to observing and noting the succession of events in individual cases it can proceed with a minimum of intellectual effort. But if, afterwards, the observer should wish to achieve something that will endure: if he wants some generalisation—some chain of cause and consequence—to come to light, then he will find out that this means severe intellectual exertion. He will very soon then come to know how difficult a thing it is to assemble and sift and complete one's observational data, and to procure a proper complement of control cases. And presently, also, he will discover that when, at the completion of a cumulative experiment all the fallacies of empirical observation, and also those of statistical or experiential evaluation have been allowed for, there will generally be left over very little of assured knowledge—often so little as not to be worth the pains of gathering in.

### *Where they Lead into Error.*

We may take the case of an experiment undertaken for testing the efficacy of a therapeutic agent:—

(1) Already in the initial operation of selecting clinical material for experimentation empirical clinical methods will mislead. Instead of their furnishing cases which are all in fundamental respects alike, they furnish a congeries of more or less heterogeneous cases.

(2) Again, in the next operation, that of giving to each of the cases which is to receive treatment an equal dose of the therapeutic agent, empiricism may involve us in error. We may easily be led astray if we assume from the fact that we administer the same dose to each patient that the same dose is in each case absorbed and brought into operation.

(3) Again, the doctrine that judgment must be based always on overt signs will, in judging the patient's condition after treatment, often mislead us. Abatement of symptoms may, for example, be registered as definite cure, and death from intercurrent causes may be ascribed to inefficacious treatment.

(4) Lastly, the principle that we must in every case judge by criteria registered directly by the senses will not seldom bring us into conflict with that principle of logic which prescribes that we should in experimentation—so as to leave no loophole for the intervention of other causes—fix our attention upon the immediately sequent and directly affiliated event, and should refrain from vaulting by, let me call it, a *saltus empiricus*, directly from the application of a remedy to some distant and perhaps doubtfully affiliated event.

To every man who has a conception of the complexity of nature, every *saltus empiricus* is distasteful. Such a man will wish, in investigating chains of causation, to search in every case only for the next following link. In other language, he will wish to progress only from step to step, never letting anything hustle him off his *passus scientificus prudens*.

The man who lives no life within the brain, and has no conception of the complexity of nature—"your plain, practical man" as he self-appreciatingly styles himself—is always hankering after the procedure here called the *saltus empiricus*. He tells you—your statistician aiding and abetting him—that this procedure should, whenever possible, be employed, and that it is nothing but simple good common-sense to eliminate from consideration intermediate links in a chain of causation.

### *Subsequent Logical Operations.*

Let us now turn to the subsequent logical operations, and see how, by the help of these, the empiricist—the man who believes in the passive observation which dispenses with inquisition and apparatus and technique—tries to extricate himself from the series of errors into which that policy leads him. It is familiar matter that he trusts here to cumulative experimentation with experiential or statistical evaluation.

By *cumulative experimentation* would be denoted that form of experimentation which has already been in question: that form where a group of treated and untreated cases are compared. By *experiential evaluation* would be denoted the procedure of keeping a rough account in one's head of the treated and untreated cases, taking into consideration in each case, so far as possible, all the significant points. By *statistical evaluation* would be denoted the procedure of arbitrarily selecting one particular criterion, and counting the exact proportion of cases in each group which satisfy and fail to satisfy it.

It will be worth while considering whether we can by these means arrive at trustworthy generalisations with respect to causal connexion or therapeutic efficiency. That is in reality to raise the whole question of the value of *cumulative experiments*, *experience*, and *statistics* in medicine.

We may begin by distinguishing two types of medical treatment. The *first* is one which may be said to float as an ideal vision before the eyes of us all—doctors and quacks and laymen. It is that in which *specific cures* are brought into operation after the method of the penny in the slot. The *second* is what we may denote *general medical treatment*.

The former type of treatment may be said to have taken scientific shape, on the one hand, in antitoxic serum-therapy, and, on the other hand, in the specific *chemo-* or *pharmaco-therapy* of Ehrlich. In either case we bring into operation therapeutic agents which are *monotropic*—i.e., agents which have a highly *specific neutralising* or *inimical affinity* for the particular pathogenetic chemical element we desire to combat.

### *Testing by Cumulative Experiment.*

With regard to testing the efficacy of such *curative agents* by the method of cumulative experiment we may usefully note the following:—

(1) When we employ these agents we limit ourselves to our one therapeutic agent, and we give each patient treated the same dose, or series of doses.

This tying ourselves down to using only one therapeutic measure, and this strict adherence to schedule, furnish the *sine qua non* for the comparison of a group of treated with a group of untreated cases.

(2) In pharmaco-therapy we almost invariably attack either a microbe or a microbic toxin—that is, we take as our chemical target an element alien to the body. It is a direct corollary of this that the organism of the patient will (we, of course, assume our chemical agent to be really monotropic) be out of our line of fire and untouched.

[1] Being the substance of an argument in the preface to the second edition of Technique of the Teat and Capillary Glass Tube. (Constable and Company, Ltd., 1921. Price 42s.)

Our task of adjudication will hereby be facilitated. For clearly the circumstance that the patient's body is, as it were, an unaffected spectator contributing nothing to the result, will eliminate many possibilities of fallacy, and bring out more clearly the specific effect of the remedy.

(3) With the class of agents we are here considering the clinical results are, when obtained, obtained promptly. In virtue of this we are spared those possibilities of fallacy which are incident to the *saltus empiricus*.

All this can go into a nutshell. When treatment conforms to the type of pharmaco-therapy, it will be possible to adjudicate upon its efficacy by cumulative experimentation and experiential or statistical evaluation.

### *The Element of Chance.*

But a reservation must here be made. In every cumulative experiment the operations of chance—i.e., the intervention of other causes—will constitute a source of error. This error of chance may be so small as to be practically negligible. This will be the case where we are dealing with sensibly homogeneous clinical material; are operating with a really efficacious remedy (i.e., an agent which has a definite inimical affinity to the pathological element we are combating); and are employing a proper scheme of dosage. Under these circumstances we shall not need in testing a remedy (and the same principle will apply in investigating a pathogenetic connexion) to employ large numbers of treated and untreated patients; and it will be possible, dispensing with statistics, to arrive by the experiential method at prompt and trustworthy judgments.

When, on the contrary, we are dealing with sensibly heterogeneous clinical material, or are operating with a pharmacological agent which has no very definite inimical affinity for the pathogenetic agent we are combating, or, again, when we are employing an ill-chosen scheme of doses, the element of chance will exert a dominating influence.

In such cases it will be necessary to employ correspondingly larger numbers of treated and untreated cases. That involves us in difficulties. The collection of sufficient numbers of cases will involve very considerable expenditure both of time and energy. Further, when the patients are collected it will require a considerable gift of tact to carry out that portion of the experiment which consists in leaving the control cases entirely without treatment. And, finally, the experimenter will have to shoulder a certain moral burden in applying the treatment in cases where it is contra-indicated, and withholding here such other treatment as would seem to hold out more promise. In brief, there are not only physical difficulties, but also humanitarian objections to the carrying out of clinical cumulative experiments on any large scale. Moreover, as the physical and moral difficulties increase, the intellectual harvest from the work becomes less and less. Finally, the task becomes so patently unremunerative that every reasonable man will cry off from statistical inquiry.

### *Where Statistics Leave us in the Lurch.*

There is yet another aspect of the question—specially important for those of us occupied in research.

When a therapeutic method gives entirely satisfactory results, or when—and this comes to the same—we are satisfied with those obtained, we have then nothing to ask from a method of evaluation except that it should blazon abroad our achievements and make propaganda. That is, for example, all that is aimed at and achieved by the statistics of anti-typhoid inoculation.

If, however, our treatment is unsuccessful, or if we do not account it sufficiently satisfactory, what we then want is not the exact number of successful and unsuccessful cases, but particulars such as are not furnished by statistics. We want, for the systematic trial and error experiments upon which all scientific betterment of therapeutics depends, to know whether our failure or comparative failure has been due to our having had under treatment a heterogeneous group; or whether it is to be ascribed to the inherent ineffectiveness (i.e., the inappropriate chemical constitution) of the therapeutic agent; or to an error in dosage; or other specifiable cause.

In default of information of that kind the only course which lies open to us is that of launching out again and again into cumulative experiments with the original treatment altered each time in such fashion as caprice may suggest. To put ourselves in heart, it is necessary to hypnotise ourselves on each occasion with the idea that this time, at last, chance is going to smile upon our random experimentation.

All the poignant futility of such self-suggestion is made manifest in the example of quinine. Here cumulative experiments of a sort have followed each other for—it must be now close upon—three hundred years. And from all those years of scientifically unguided experimentation with different preparations and sundry and divers doses, all that has clearly emerged is: that while, in certain forms of malaria and in conditions which cannot be clearly particularised, therapeutic effects are not unfrequently achieved, quinine is very far from furnishing a cure for malaria generally. Quite other information—information that cumulative empirical experiment cannot supply—is required for the improvement of treatment. We require to know what concentration of quinine should be achieved in the blood in each different form and stage of malaria, and how long this concentration should be maintained. And, above all, we require to know whether the organism of the patient should, when quinine is administered, play the part of the neutral spectator, or whether the doses of the drug should be so adjusted as to allow of the organism of the patient joining in with a therapeutic effort.

This in itself suffices to show that even in the domain assigned to pharmaco-therapy—in other words, in the ideally favourable field for the employment of the method—cumulative experiment is almost unserviceable for the improvement of treatment.

### *Cumulative Clinical Experiment inapplicable to General Medical Treatment.*

It is now time to see whether cumulative clinical experiment can be put to any use in connexion with general medical treatment. In pharmaco-therapy the programme is to take in hand the disease in its earlier stages, to leave the organism of the patient out of account, and let the therapeutic agent do the work. In general medical treatment the programme is entirely different. We now aspire to exercise directive control over the physiological machinery of the body—checking from moment to moment such reactions as may be excessive, spurring on those that are torpid, and supplementing, so far as we can, the responses which make default by supplementary responses artificially evoked. Further, in general medical treatment we are prepared to undertake the patient in any stage in the disease. And the ideal we set before ourselves is that of trying to pilot him back to health by constant opportunist intervention.

Reflection will show that such a programme is incompatible with the undertaking of any cumulative experiment. It is, as we have seen, a precondition for every such experiment that there shall be a definite schedule of treatment which is not departed from, and that the cases shall distribute themselves into two sharply contrasted groups. But in general medical treatment, as in the steering of a motor-car or a ship in a crowded thoroughfare or fairway, we work not by schedule, but by following the indications of the moment. And as we never encounter precisely the same set of circumstances, we never treat two cases in exactly the same way; and thus can never obtain a group of cases treated all in one way, to contrast with a group of cases treated all in another.

### *Two Possible Exceptions.*

To the general proposition that the method of cumulative experiment is inapplicable when general medical treatment is in question, there are two exceptions. The *first* is the case when we superadd

a therapeutic agent which exerts a specific and immediate or quasi-immediate result. The *second* is the case where we apply as an element of general medical or surgical treatment a code of procedure which makes so great a difference in the results as to exclude the fallacy of chance; and where, further, the fallacy of superior professional skill being enlisted in favour of the one or other method is excluded, as it is where man after man has made a comparative trial of the two methods.

Here a favourable or unfavourable verdict upon a therapeutic measure can go forth if the procedure under trial is competent to swamp the effects of all the measures employed in association with it, and to dissever in a manifest manner the group of cases which have received only general treatment from those which have received also the special treatment.

Again, in respect to trial and error experiments for the scientific betterment of therapeutics, the conditions in the domain of general medicine are infinitely less favourable than in pharmaco-therapy. In the latter we have, so far as our therapeutic agent is concerned, to consider only modifications in its dosage and eventual modifications in its chemical structure. In general medical treatment—for here we apply a multiplicity of procedures—we have an infinite number of variables, each one of which would be competent to modify the result. We can, therefore, here never hope by cumulative clinical experiments to do anything appreciable for the betterment of treatment.

Still in other respects—respects which materially affect experiential and statistical evaluation—are the conditions in general medical treatment different from those in pharmaco-therapy. We proceed in pharmaco-therapy on the conception that all the phenomena of disease proceed from a single cause and are connected up single file like the links in a simple chain of causation. Conformably with this mental picture we expect the retrenchment of the original pathogenetic agent (microbe or toxin) to annul the whole train of pathological phenomena and utterly abolish the ailment. That is what we have in mind when we speak of a *cure*.

Cures thus understood furnish material which satisfies the requirements of statistics. These are satisfied, first, in the respect that we have in *cures* (i.e., in the purging of the organism from a pathogenetic element) data which are quite definite and clean cut, and easy to appraise; and, secondly, in the respect that we have in the kind of cures here in view (those affected by pharmaco-therapy), effects which are directly engendered and attributable exclusively to the agent we bring into operation. The importance of this for the evaluation of therapeutic measures will presently appear.

### *Conception of Sanation in Place of Cure.*

In general medical treatment we proceed upon a different and unquestionably profounder view of the processes of disease. Instead of regarding these as proceeding from a single cause and ranged up in the form of a single chain of causation (a picture in reality applicable only to the initial events in any disease), we now perceive that each morbid phenomenon is the resultant of many causal factors, and that in consonance with this our therapeutic measures must be directed against a multiplicity of pathogenetic forces.

In a word, we now put in the place of the conception of *cure* the conception of *sanation*. This is indicated by a change of vocabulary. We tacitly drop the term *cure* and employ instead the terms *clinical improvement*, *recuperation*, *recovery*, *convalescence*, and *restoration of health*.

This change of programme makes, when we come to evaluation, an important difference; for the form of clinical achievement at which we now aim is one which does not lend itself to statistical evaluation.

### *False Conclusions from Individual Experiences.*

Clinical appraisement in connexion with general medical treatment conducts also into other error. It not infrequently leads us to draw from individual experiences false conclusions. When a patient gets well we are, without regard to the circumstance that our treatment may have been ineffective or hurtful, prone to conclude that treatment has not only in the particular case been effective, but also that it will be universally useful. Again, where the clinical event disappoints expectation, we are, without regard to the circumstance that the therapeutic agent may have perfectly accomplished its mission, prone to regard that agent not only as having in that particular case been useless, but as one which will on all occasions be useless.

The reason for such misjudgments is to be found in that fact that we here judge by contingent and indirectly engendered effects.

It will perhaps be profitable to show, first by an example culled from our domestic surroundings and then from one supplied by medicine, how judgment by contingent and indirectly engendered effects conducts into error.

When our electric bells have refused to function, and the filling of the battery with water has made them ring, we might, if we knew no more about the mechanism of those bells than the ordinary man does about the body, quite well suppose the pouring in of water to produce without other intermediation the ringing of the bells. And, again, if the filling up of the battery failed to make the bells ring, we might quite naturally pronounce this pouring in of water a quite futile procedure.

Both kinds of false inference would clearly be due to our neglecting to investigate the direct effect of pouring in water, and arrogating to ourselves the right to draw by experiential or statistical evaluation conclusions from remote effects.

### *Arrest of Hæmorrhage as an Example.*

A comparable example in medicine would be adjudicating by clinical effects upon the efficacy of measures for the arrest of hæmorrhage. Sustained bleeding may be due (*a*) to delayed blood coagulation; (*b*) to the unsatisfactory quality of the fibrin meshwork; or (*c*) to deficiency of red corpuscles—these last being required to fill out the meshwork of fibrin and convert this into a sufficiently massive tampon.

This once comprehended, it becomes clear that when arrest of hæmorrhage—or, to be more precise, prompt and durable hæmostasis—has in this or that instance followed a particular therapeutic intervention, that gives no warranty for assuming that the result has here (any more than in our last example) been directly produced by the procedure adopted, nor yet that this will prove a method of general utility. Nor, again, when a particular therapeutic intervention has failed to arrest hæmorrhage does that warrant the conclusion that the method in question has failed in its appointed task, or that the accomplishment of that task will never be contributory to the arrest of hæmorrhage.

With regard to such misjudgments based on individual experiences the accepted statistical doctrine teaches that all false judgments are quashed when we collect enough cases. That is false doctrine. When cumulative experiments are undertaken with heterogeneous clinical material our misjudgments need never be reversed. In fact, erroneous verdicts will almost inevitably be pronounced. If, for example, we administer to a group of undifferentiated cases of bleeding—a group in which by chance each of our three varieties of bleeding is equally represented—a remedy which is sovereign for one of those varieties of bleeding, our remedy would be pronounced unsatisfactory as giving success only in one case out of three. And if in our experimental group the class of case for which our remedy was appropriate was unrepresented, or only very scantily represented, the statistical conclusion would be that that remedy was utterly useless.

And—let this be observed—we should, failing the application of laboratory methods for differentiating the different kinds of bleeding, never learn whether the appropriate variety of bleeding was included in our experiment, and in the case where all varieties were included in what proportions the several kinds were included. We should, in fact, be confronted with

the situation which presented itself in the typhoid statistics of the South African War, where the efficacy of the process of anti-typhoid inoculation was judged of by clinical methods which required of that inoculation process that it should give protection not only against typhoid fever, but also against paratyphoid A and paratyphoid B.

It is, in sober truth, "old abusing God's patience" to go on dreaming that statistical evaluation conducted with the data ordinarily supplied by clinical observation can ever conduct to any trustworthy quantitative estimate of the value of a therapeutic measure.

*How Laboratory Methods remove Difficulties.*

We may now examine and see in what way recourse to laboratory methods clears away the difficulties which beset the path of research. First and chiefest the employment of laboratory methods makes it possible to substitute in many cases for cumulative or group experiments (experiments where the conditions are so complicated that the individual cases give different results) crucial experiments—experiments where the conditions are so simple that each individual case gives one and the same result. These crucial experiments furnish us with a series of firmly established facts which will, like fixed points in a trigonometrical survey, supply a foundation for the mapping out of all the rest of the territory. Firmly established facts, such as are here in question, would be the fact that such and such a microbe produces such and such a disease; that a particular modification of the blood converts it into a favourable culture medium for a particular microbe or for all microbes; and that a vaccination process produces such and such changes in the blood.

A second but also supremely important function of laboratory methods is that of making of the method of cumulative experiment a more effective instrument of research.

(*a*) To begin with, laboratory methods enable us to select, out of that raw and heterogeneous material which clinical examination provides, cases which are more nearly homogeneous—in other words, better material for experiment.

(*b*) Where we administer a therapeutic agent and suspect that, by reason of non-absorption, this agent does not regularly come into operation, we can, if suitable technique for blood examination is available, ascertain whether our surmise is well founded and, if so, in what cases.

(*c*) Recourse to laboratory methods saves us from making a *saltus empiricus* and so precipitating ourselves into fallacies. When laboratory methods are at disposal we, instead of trusting to the remote effects which make themselves sensible to the unaided senses, adjudicate by direct effects. When, for example, antiseptics are applied to infected wounds, we can ascertain by the method of culture, without either question or statistical delay, whether the microbes have been exterminated or reduced in number.

(*d*) The employment of laboratory methods makes it possible when dealing with a complex procedure, such, for example, as sanatorium treatment, or the technique of aseptic surgery, or vaccine-therapy, to investigate the effect of the separate items of treatment instead of noting only the effect of the procedure taken as an aggregate.

(*e*) Finally, we can, by resort to laboratory methods, find out what has been achieved by treatment. We have here at disposal cultural methods, also opsonic measurements carried out in connexion with auto-inoculation procedures, and, in the case of syphilis, the Wassermann procedure and the more accurate derivative method of Dreyer and Ward.[2]

*Conclusion.*

In conclusion, it will be well to take brief account of two questions which, in the perusal of the above, are bound to have come up in the mind of the reader. He will have asked himself whether the recognition of the fact that clinical observation is an essentially imperfect instrument for adjudicating on the efficacy of therapeutic measures is not going to involve as its consequence the ousting of the clinical observer from his present office of expert and adjudicator in questions of therapeutics. And, again, the reader will have asked himself whether, in those domains of medicine where no appropriate laboratory methods of investigation lie ready—and there are, of course, many such domains—clinical cumulative experiments, such as have always been going on, should not be persisted in, and whether, at least in these scientifically untilled provinces of medicine, the clinician should not for the present be confirmed in his office of adjudicator.

Both these questions can be answered in a very few words. The first finds its answer as soon as we bring the concept *adjudication by experts* into quite sharp focus in our minds. It then becomes evident that by an expert is meant a man who carries in his head a precise mental picture of the mechanism by which an effect is produced, and who is at any rate competent to investigate such machinery. When anyone who has possessed himself of this definition is, in connexion with problems like those of the cause and treatment of shock, or the effect of anæsthetics, or the efficacy of antiseptics in an infected wound, or the treatment of malaria or vaccine-therapy, interrogated as to whether the surgeon and physician are in matters of this kind experts, his reply must inevitably be that the surgeon and the physician have in such matters, exactly like the layman, vision only of the final result.

The further question as to whether the method of cumulative clinical experiment should be persisted in in those regions of medicine in which the requisite laboratory methods of investigation do not yet exist, can be disposed of also in a few words. It is clearly not a matter of very great importance to the world whether men who are prepared to waste their time do or do not waste it over experiments which are doomed for the most part to be futile. But what does seriously matter is that it should be contended and believed that failing preciser methods of investigation, it is inevitable necessarily to have recourse to cumulative clinical experimentation, and to requisition the services of the statistician.

As doctrine that is erroneous. It may quite well be necessary, when other means have failed, to have recourse to clinical cumulative experiment. But the trained expert put upon the job can, given time, practically always meet the needs of the moment, or at least some of those needs, by the invention of new methods.

[2] G. Dreyer and H. K. Ward: THE LANCET, 1921, i., 956.

## AN EXPERIMENTAL STUDY OF PROPHYLACTIC INOCULATION AGAINST SCARLET FEVER.

(PRELIMINARY COMMUNICATION.)

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OF the acute infectious diseases caused by filtrable viruses—e.g., small-pox, hydrophobia, scarlet fever, typhus, and tsutsugamushi—only the first two can be successfully prevented by prophylactic inoculation. There are no specific treatments for the others, chiefly because no method of attenuation of the viruses has been discovered. At the general meeting of the Keio Medical Society in November, 1920, Prof. S. Kusama made a very important report[1] on an experimental study of prophylactic inoculation against typhus with infected monkey's blood which had not been attenuated by passage through animal bodies or by any other means. By dilution of blood obtained from human typhus patients, injections were given causing no reaction in the animal bodies, but conferring a degree of active immunity upon the

[1] This report appeared in THE LANCET of August 20th, p. 386.

animals. The quantity of virus necessary to give this degree of immunity was found to be less than 1/100,000 of the quantity required to cause the disease. (Tokio Ijishinshi, No. 2204, Nov. 20th, 1920.)

This important discovery threw new light upon prophylactic inoculation for many of those acute infectious diseases, specific treatment of which had till then been thought impossible. I determined to apply Dr. Kusama's method of prophylactic inoculation to measles and other diseases. I intended to begin with measles, as a comparatively mild disease which no one can escape, but unfortunately for my purpose, all five of my own children had already had the disease, and I was unable to procure others. Just at the time a typical scarlet fever patient came into my hospital. I made up my mind to carry out a test of prophylactic inoculation against scarlet fever, using my children as the experimental objects.

*Previous Experimental Work.*

Before the prophylactic inoculation in the human body against scarlet fever can be undertaken, the distribution of the virus in the human body and its virulence in the particular epidemic, must be determined. It is necessary to find out the minimal morbid dose of the blood or secretions which contain the virus. Judging from the literature, experimental results have differed according to the intensity of the virus in various epidemics. Grünbaum, Cantacuzene, Bernhardt, Landsteiner, Levaditi and Prasek, Levaditi and Danulesco, and Koga obtained blood or secretions from the throat or tonsils of scarlet fever patients just before the appearance of the eruption, and smeared them over the throats of, or injected them subcutaneously into, gorillas or monkeys. From the results obtained there is no doubt that the blood and secretions named contain the virus. The quantity of blood used was more than the minimal morbid dose. Bernhardt produced the disease in a monkey with 0·25 c.cm. of fluid from a vesicle of the skin taken from a patient four days after onset of the fever. There have been no experiments on human beings, and consequently the minimal morbid dose for man is not known. It is probably less than 0·1 c.cm. It was hardly practicable to determine the minimal dose of the virus of this year's epidemic before the quantity of the prophylactic dose was determined. Therefore, according to the results obtained by previous investigators on monkeys, I used in the following experiment 0·1 c.cm. as the minimal morbid dose of the virus of the present epidemic.

I.—*Prophylactic Inoculation.*

*Materials.*—Blood obtained from the median vein of arm of a scarlet fever patient S., a girl of 11 years old. The past history and present illness described in brief are as follows: General health had been always good; she had had measles and had been vaccinated once; no hereditary disease (tuberculosis, syphilis, &c.). Present illness began Nov. 24th, 1920, with sudden chills; examination on admission to the hospital the next day showed bright scarlet rash over the vault and arch of the mouth, both tonsils swollen, the root of tongue coated yellowish-white, and tip of tongue bright scarlet; the rash seen faintly over face, neck, and chest. Temperature was 39·6° C. On the third day the rash became more distinct, and spread over the inner sides of the thighs; the fever rose and patient became delirious. On the fourth day the rash extended over all the extremities; distinct strawberry tongue; face bright scarlet except around the mouth. These conditions continued during fifth and sixth days, and on the eleventh day scaly desquamation began. This patient had bronchitis and the fever recurred, but in a few days the temperature returned to normal.

The blood was taken on the sixth day of illness. The sterile syringe contained 2 per cent. sodium citrate in physiological salt solution, and the same amount of blood was taken from the median vein of the arm. The blood was transferred to four test tubes containing a fixed amount of 1 per cent. sodium citrate solution, so that 1 c.cm. of the diluted solution in the test tubes contained 0·0001 c.cm. of the patient's blood. The blood was thus diluted 10,000 times with the citrated salt solution. This dilution was used as the material for injection. The experimental objects were five of my children, all in good health; they had all had measles and had been vaccinated. The eldest daughter had erysipelas at 9 years old, but no other serious diseases.

*Experiment.*—On Nov. 29th, after shaking the tubes containing the diluted blood so that the virus would be equally distributed in the solution, certain amounts of the solution were injected subcutaneously in the interscapular regions. The ages of the children and the amounts of diluted blood injected were as follows:

| Names. | Ages. | C.cm. injected. | Names. | Ages. | C.cm. injected. |
|---|---|---|---|---|---|
| Girl E. | 10 | 1 | Girl H. | 6 | 1 |
| Girl A. | 8 | 1 | Boy J. | 3 | 0·5 |
| Boy I. | 7 | 1 | | | |

From time to time during the next three weeks I carefully examined their temperatures, urine, throats, and general symptoms. In all cases there was no local reaction in the shape of swelling, redness, or pain, and absolutely no general symptoms (e.g., fever, pharyngitis, albumin in urine). The two elder girls went to school and the rest of the children played around the house as usual. The above experiments prove that sufficient dilution of injected blood renders it powerless to cause the disease in human subjects. In order to discover whether immunity was conferred by injections I determined to try an infection experiment with proper material; on Jan. 4th, 1921, I obtained a scarlet fever patient through the kindness of Dr. Kurabe, and made the following infection experiments.

II.—*Infection Experiments.*

M., a schoolboy 17 years old, whose general health had been good; he had had measles and had been vaccinated; no serious or hereditary disease. The present illness began on Dec. 31st, 1920, with sudden attacks of shivering. Examination on Jan. 5th, 1921, showed eruption all over the face, except around the mouth, and over the body. Tonsils and tongue showed typical picture of scarlet fever; temperature was 39·6° C. and pulse 120; delirium and muttering at times. On Jan. 5th, at 1 P.M., the blood was taken as in the previous experiment, and diluted with citrated (1 per cent.) physiological salt solution so that 1 c.cm. of the final dilution contained 0·1 c.cm. of blood. The above dilution was injected subcutaneously into four of the children in the interscapular region.

| Names. | C.cm. injected. | Names. | C.cm. injected. |
|---|---|---|---|
| Girl E. | 1·5 | Boy I. | 1·5 |
| Girl A. | 1·5 | Boy J. | 0·6 |

I did not know how much of the virus of the present epidemic of scarlet fever was necessary to infect a human being. To determine the minimal morbid dose in man is impossible, and as Bernhardt infected a monkey with 0·25 c.cm. of the fluid obtained from a skin vesicle, I presumed that 0·1 c.cm. would probably infect a human being, so I took 0·15 c.cm. of the blood for the experiments. During the next three weeks I again carefully observed the children as before. There were no local reactions and no general symptoms.

The above experiments prove that injection of 0·0001 c.cm. of the blood of a scarlet fever patient into children produces no reaction, but confers a degree of active immunity sufficient to prevent occurrence of the disease on introduction of the virus contained in 0·15 c.cm. of blood.

Clinical observation and animal experiment show that scarlet fever is spread directly or indirectly by the secretions of the patient's nose and mouth. In natural infection the virus transmitted from the one to the other must be very minute. From the immunity derived from an injection of 0·15 c.cm. of blood given subcutaneously it might safely be assumed to prevent ordinary infection. I therefore made the following experiments in imitation of natural infection.

### III.—*Experiments with Smeared Virus.*

In this experiment the material used was a mixture of the blood and throat secretions of a scarlet fever patient. This patient, a young man of 22, had had measles and had been vaccinated; his general health had always been good. The present illness began on March 6th, 1921, with sudden shivers and fever; scarlet fever was diagnosed by a physician, and on the 8th patient entered the Kitasato Institute Hospital. On the 10th, when I collected the material, he had eruption all over the body, the tongue was coated pale white, the tip was a bright scarlet colour; temperature 37·4° C. The throat secretion was obtained after careful gargling, and the blood was taken from the median vein as in the previous cases. To determine the presence of the virus in the materials collected, the secretion was subcutaneously injected into monkey No. 148 and the blood into monkey No. 146. The former had fever of 40° C. on the 15th day, lasting for five days; the latter had fever on the 7th day, rising on the 10th day to 39° C. with eruption over the face, especially around the eyes. These symptoms agreed with those of experimental scarlet fever in man.

Throat secretion and blood were mixed and a cotton pledget, soaked in the mixture, was carefully smeared over the mucous membrane of the tonsils and throats of the children who had received prophylactic inoculation. As virus smeared over the mucous membrane was liable to carry infection to others, the two oldest children, who were attending school, and the youngest, who was still at the breast, were excluded from this experiment; only the boy I. and the girl H. received the smeared material. For the next three weeks I carefully examined the temperatures, urine, and throats of the children, but there was nothing to be noted at all. Thus the inoculation completely protected the children from the disease.

### IV.—*Summary.*

From the foregoing experiments it is clear that prophylactic inoculation against scarlet fever with the blood of a patient, taken before the eruption appears and given subcutaneously in an amount of 0·0001 c.cm., causes not only no local or general symptoms in man, but protects him from infection. Even an injection given 50 days after inoculation with the blood, and smearing the children's throats with the mixture described above, 115 days after inoculation, did not give rise to the disease.

It has been claimed by some investigators that one-third of human beings have a natural immunity against scarlet fever, and perhaps my children had this natural immunity. Moreover, it has not yet been determined that the dose of blood given in the infection experiments was enough to infect the children. Taking these facts into consideration, I cannot claim that these experiments are flawless; but considering the results which Dr. Kusama obtained with typhus fever, the fact that the experimental objects were of the most susceptible age, and the fact that the control monkeys showed the presence of the virus in the material used for the smearing, it is not an overstatement to say that the experiment strongly suggested the efficiency of prophylactic inoculation against scarlet fever.

On the effective period of immunity and its time of appearance after inoculation will be reported later.

My thanks are due to Dr. Kusama, who has given me valuable guidance, and to Dr. Karube, Dr. Sukekawa, and Dr. Miyajima, who have greatly assisted me.

LITERARY INTELLIGENCE.—The twelfth edition of Bruce and Dilling's "Materia Medica and Therapeutics" is announced for immediate publication by Messrs. Cassell.—Messrs. J. and A. Churchill have just issued a 48-page catalogue of medical and scientific publications. The forthcoming appearance is announced of "An Introduction to Biophysics" by Dr. D. Burns, Grieve Lecturer in Physiological Chemistry at the University of Glasgow, with an introduction by Prof. D. Noel Paton, F.R.S. The subjects dealt with include energetics, cellular mechanics, cell communities, transport, and the organism as a whole.

## X RAY TREATMENT OF TWO CASES OF OTOSCLEROSIS.

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IN dealing with otosclerosis we are "confronted with one of the most difficult and obscure problems in modern medicine" (Gray). And because its ætiology and essential nature are still largely unknown or in dispute, and its course one prolonged usually over so many years (often with intermissions or natural arrest), to make an estimate of the true value or otherwise of any treatment is a matter of the greatest difficulty. In well-established cases, which are perhaps the great majority of those presenting themselves, permanent bony damage has already taken place at the stapes-foot, with possibly secondary nerve impairment, and such cases afford no fair test of the value of radiation treatment, any more than late inoperable malignancies, old-standing exophthalmic goitres or (as I have noted) acromegalies. It is only in the earliest stages when there are young actively proliferating or hyper-functioning cells that radiation can be expected to benefit to a satisfactory degree. Now, unfortunately, as Brühl says, otosclerotic patients rarely notice the earlier tinnitus or slight impairment of hearing, and therefore do not usually apply for advice till the newly-built bone at the annular ligament of the oval window has reduced the hearing to a marked degree (whispering reduced to 0·5 m. or less). This being so, there is nothing to be wondered at that some otologists hold the view, and frankly tell their patients, that it is an "incurable" complaint.

Prof. Siebenmann, the eminent oto-laryngologist at Bâle, has been experimenting since 1912 with radiation treatment, encouraged, at the beginning, with the good results obtained by radiation of an ostitis fibrosa case (as he remarked at the Oto-laryngological Congress at Kiel in May, 1914), and while awaiting an analytical report from him on the results of his many hundred cases, it may be of interest to bring the matter forward, discuss the rational basis for the treatment, and give the results of two cases treated.

*Theories as to the Cause and Nature of the Disease.*

There are about ten distinct theories as to the cause and nature of the disease. The earliest opinion was that it is secondary to middle-ear inflammation (of mucous membrane or periosteum); later views are that it is a primary condition, either a bone disease or an abnormal development of the cartilaginous remnants in the labyrinth capsule, or is due to vascular conditions (active hyperæmia, anæmia, and venous congestion each having supporters). Then there are toxic and bacteriological, internal secretion, and chemical theories; and there is the nervous theory, that the sometimes associated degeneration of the labyrinth nerve is primary, and the bone change secondary to this; and the developmental theory, that there is arrested development or degeneration of the organ of hearing as a whole, central and peripheral. There seems no doubt that many factors can excite its appearance in a predisposed person. Brühl, in this connexion, gives authorities for syphilis, arteriosclerosis, chills, internal secretion changes, latent tetany, rheumatism and gout, uræmic intoxication, scrofula, anæmia, rickets, osteomalacia, auto-intoxications, tuberculosis, tropho-neurosis, and wasting diseases. The hereditary nature is most marked, as with bony abnormalities (polydactylism, multiple exostoses, &c.) and some bone diseases (Paget's disease, achondroplasia).

Katz was the first (1890) to publish the microscopic findings in a case diagnosed during life as a stapes-ankylosis. Toynbee (1863) and Tröltsch (1881) had called the condition "sclerosis," and for long it was

considered a special form of chronic middle-ear "dry catarrh." Moos, in 1867, and Politzer, in 1893 and 1901, gave reasons for considering it a primary disease of the bony labyrinth, as in the great majority of cases the middle-ear mucous membrane was found perfectly normal, while in many preparations the most marked changes were found in the deeper layers away from the mucous membrane. Specimens were soon noted which showed scattered islets of similar bony changes throughout the petrous bone, with or without stapes involvement. Further, labyrinth-atrophy was sometimes met with on the affected or on the opposite side, and Manasse brought forward a nerve-degeneration theory which was supported by many. Brühl, in an excellent recent summary of our knowledge of the disease, points out that the facts suggest rather that labyrinth-atrophy, when met with, must be secondary (or a post-mortem change), Manasse himself having demonstrated a preparation showing stapes-fixation without definite labyrinth change, and in his more recent works (1914 and 1917) coming nearer to Brühl's view that the primary change is in the bone. As to vascular theories, O. Mayer, Cornet, and Gray have all wholly or largely given up earlier theories of theirs as to its origin in local anæmia (arterio-sclerosis, syphilitic endarteritis, or thrombosis), and this clears the ground somewhat for a basis for radiation treatment. Mayer now considers it an "undescribed variety of ostitis fibrosa," an "osteofibromatosis." Instead of anæmia there is increased vascularity (clinically suggested by the sometimes seen "flamingo-red" flush on the promontory), it presents appearances like Volkmann's "vascular ostitis," is a "chronic metaplastic ostitis" (Manasse), and has apparently close relations with osteomalacia. As Ferreri says, there seems "a great affinity" between osteomalacia, rickets, and otosclerosis. All the patients in Arcangeli's clinic with osteomalacia also had otosclerosis, and on this relationship Siebenmann's phosphorus treatment is based, whether increased ovarian internal secretion (with hyperæmic results elsewhere) or that of other endocrine glands, or calcium (Kobrak) or chloride (Cornet) retention be ultimately at fault. It must frequently at least be an endocrine gland anomaly, as Alexander has found otosclerosis in cretins (human and animal). Gray regards it now biologically as a "variation," a degeneration of the later-evolved auditory as distinct from the equilibrative mechanism of the ear (the latter fully-developed already in fishes, the former appearing with reptiles or early amphibians).

Siebenmann, on the other hand, regards it, on the basis of many histological researches from his clinic, as an over-development in the labyrinth of cartilage remnants which normally are there at least till adult life (Taniyama), especially in the region in front of and above the oval window. The labyrinth is practically full-size at birth, and if it continues to develop in the confined space it is in (Kerrison), as the skeletal bones normally do, by absorption and new bone formation, there must be marked changes, beginning, in Siebenmann's view, at the boundary of the original cartilaginous and the later periosteally developed labyrinth-capsule. (Brühl thinks the predilection for the region in front of the oval window is due to the bony stresses set up by the pull of the tensor tympani muscle. Gray thinks that in addition the stresses set up by the continual stapes-vibrations sensitise the bone in the neighbourhood to new formations or pathological changes.)

The earliest changes are rather matter for dispute, Brühl finding them in the vessel-canals of the old periosteal bone, absorption of the bone round these, and subsequent new building of an abnormal spongy bone; Mayer, in the transformation of the connective-tissue cells of the marrow and vessel-canals into osteoblasts and osteoclasts, so that "this richly cellular fibrous marrow causes on the one side an absorption, and on the other a new growth of bone" (1912). In both ostitis and otosclerosis are found, as Sohier Bryant, in his exhaustive analysis of the ætiology of the condition (1913) points out, increased vascularisation, granulation tissue, replacement of the normal bone by osteoid tissue, exostosis and hyperostosis, a definite line of demarcation (Pommer's cementing line), the formation of giant-cells, origin in the endosteum or periosteum, cellular marrow transformed to fibrous, and finally new atypical compact bone. Bryant calls it an "osteodystrophy." The marrow is atypical, as myelocytes and normoblasts are absent (Wolff). The giant-cells are of interest; up to 12 nuclei have been seen (Jenkins).

As Denker in his analysis of the 26 or so cases, and literature to 1904, gives nearly five pages of references, and Bryant, in 1913 (writing on the ætiology chiefly), gives seven and a half pages of references in small print, it is clear the subject is an immense one. The main point for the present purpose is that the pathology of the condition suggests that in its early stages it should be amenable to radiation treatment. Diathermy has been found to give bad results (Joseph); more is to be hoped for from the "ischæmic power of radiotherapy" (Chevriet and Bonnot), and its action on certain types and growth-stages of cells. Additional grounds for believing the treatment may be of avail are (2) the effects of radiation on growing cartilage and bone in young animals (Récamier); (3) the well-known curative effect of radiation on tuberculous bones and joints (Albert-Weil, Wetterer, Iselin, Petersen, &c.); and (4) the results of radiation on young osteomata (Chevriet and Bonnot).

*Early Results of Treatment.*

The first to try X ray treatment in otosclerosis, so far as I am aware, was Jaulin, in 1908. He applied 1–2 H weekly (5–7 Benoist) through an ear-speculum, the rays directed on the tympanum. 3–14 sittings were given. Of ten cases six improved: he stated they improved more in their voice-perception than could be shown by objective tests; tinnitus also improved. Schwartz treated three cases with six doses at monthly intervals, in one case with surprisingly good results, the hearing becoming practically normal; one showed no improvement, the third was slightly better. Ortloff, in Freiburg, reported ten cases in 1913, with negative results as regards improvement, a "middle-soft" Müller water-cooled tube being used, a third of a pastille being given on each of three successive days, then a 2–3 weeks interval, then another series (sometimes a pastille dose being given at one sitting with 2–3 weeks pause). Two or three series were usually given, in one case four series. The dose was measured apparently (being an unfiltered pastille dose) to the external ear: Jaulin calculated his one or two-fifth dose to the tympanum. Ortloff was not very fortunate in his choice of cases, only one had a history of one or two years (Case 6), some having eight or ten years' history of deafness. The results on the hearing, tested by Prof. Bloch's elaborate scheme, were uniformly negative; if there was slight improvement it was invariably followed by return of the tinnitus and deafness as before. (The possibility of therapeutic aim at *arrest* of the process is briefly referred to in conclusion.) As the tube-size and distance are not given it is impossible to compare the doses given by Jaulin and Ortloff, but considering the position of the oval window (behind the post. inf. quadrant of the tympanum, but partly hidden in 32 per cent., and quite hidden from the tympanum in 19 per cent.—refer. in Ortloff), and the necessity for penetrating the bone, even in the case of the most favourably placed oval window, to at least 3–4 mm. with sufficient radiation, neither Jaulin nor Ortloff seems to have used a sufficiently penetrating ray, or enough total dosage. The difficulties are certainly great. Siebenmann's cases have been treated on another scheme, and, while I should not be justified in publishing the complete technique used at Bâle (being the as yet unpublished work of others), it may be said that a cross-fire method is used on to the fenestra ovalis, with a 4 mm. filter. Schemes of fractional and full

doses have been worked out, and the total dose advisable for each ear has been the subject of investigation. A certain amount of hair-fall takes place, temporary only, but no deleterious effects have been noticed on the labyrinth, dura, brain, hypophysis, or in other ways. Coolidge or Müller's boiling tubes are used. (I should be glad to give fuller details of the technique to any interested who write to me.) During a visit to Bâle Prof. Siebenmann kindly gave me fully his views as to the theoretical grounds for the treatment, and explained that he advises it in late cases with the hope of arresting the process at the stage it is in, and in early cases with the hope, and in fortunate cases with the result, not only of arresting it, but of causing some slight improvement. No more, considering the pathology of the condition, can be hoped for. It might be of use in certain cases to combine ovarian radiation with the ear radiation (*see* Wetterer on beneficial results with ovarian irradiation in osteomalacia). In a recent communication (June 16th, 1921), Siebenmann writes that "his trial of the method has not continued long enough for him to come to a definite conclusion on the matter"; he began "with a good dose of optimism," but the results "are only to a small degree positively encouraging." As a number of radiation schemes have been used, and these only in the last four years to any considerable extent, it is still too early to hope for much in the way of results. But the method seems to deserve full investigation, as even if the treatment only arrests the usually inevitable progress of this common and disabling complaint (perhaps even only in certain types of cases, as may be defined by further research on the subject), it will have achieved a great therapeutic success in a region which hitherto has been, for the most part, a despair of the internist and the otologist, and, as a result, a "happy hunting ground" for the quack in various forms and disguises.

### *The Author's Cases.*

My two cases are as follows:—

CASE 1.—Mr. F., aged 37, no hereditary history, R. ear began to be affected 15 years ago, L. ear about 10 years ago, had consulted many of the leading otologists in England, and tried pneumo-massage, &c., had been told it was almost certain to progress slowly and was incurable. On a visit to Switzerland, in the spring of 1920, with the hope that the high dry air for some months might effect some improvement, he consulted Prof. Siebenmann, who recommended X ray treatment as the only thing likely to arrest the course of the disease. Recommended to me by a medical friend of his. Being very sceptical as to possible benefit, I made a visit to Bâle, after some correspondence with Prof. Siebenmann, largely also to choose between the various schemes of radiation employed. The patient understood that the most that could be hoped for was arrest, which he greatly desired, as his wife said he was worse than he was six or eight months ago, and any further increase in his deafness would cut him off completely from social enjoyments. Tympani were normal, no operations had been performed (though one had been recommended in the nose), whispering heard at the ear only, R. ear with C fork, Rinné −12, L. ear −7. After the treatment, as anticipated, there has not been any change whatever to remark on; the watch was heard, if anything, slightly further away on the left side than before (from 1–1½ in.). So far the condition seems stationary, both as regards hearing and tinnitus. It will require another year or two to show if it is progressive.

CASE 2.—Miss H., aged 25, no hereditary history was made out, but a brother and a sister show signs of the disease coming on. No operations, but a history of nasal catarrh. She was referred to me by Dr. J. W. Stenhouse, and as she was attending the Ear Hospital, under Dr. Frank Wrigley, he kindly saw her before I began treatment, and wrote that as "he was quite sure she was not going to improve with the ordinary methods of treatment, it would be quite worth while to try X rays." He viewed her as a mixed otosclerosis and catarrhal case. R. ear began about eight years ago, left not until about seven months ago, since when it had become rapidly worse, and she was in danger of losing her employment (office work). Marked tinnitus both low and high. Paracusis Willisii. Watch at R. ear at ¼ in., L. ear about 1 in. R. ear, Rinné −6; L. ear, Rinné −6. After treatment over three months she had distinctly improved, could hear a clock at her home that she had not heard for eight months, the low-toned tinnitus in the left ear was much less, and was away for considerable periods (Ortloff's fifth case showed improvement in the low tinnitus—? vascular, of hyperæmic origin, Mayer, Brühl, &c.), and Dr. Wrigley, examining her on April 30th, found definite improvement on both sides; she could hear his watch (a softly-ticking one), which she had not previously been able to do. Treatment was continued, and the improvement maintained. On June 16th the watch was heard at R. ½ in., the L. 1½ in. In letter of August 15th the improvement was reported as continuing, "can still hear the clock." It is hoped that this slight but definite improvement will be maintained, and in any case that the process has been arrested, as Siebenmann finds is sometimes apparently the case.

My thanks are due to Sir William Milligan and Dr. Frank Wrigley for their interest and encouragement, and to Prof. Siebenmann for his kindness and patience in correspondence and on my visit to his clinic, and to Dr. Löffler and the sister-in-charge of the Rontgen work, at the Physical Treatment Department of the Bürger-Spital, Bâle, for their kindness in giving me details as to the method of treatment.

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# STUDIES FROM THE ST. ANDREWS INSTITUTE OF CLINICAL RESEARCH.

## III. A SCHEME FOR THE INVESTIGATION OF DISEASE IN CHILDHOOD.

BY ANDREW ROWAND, M.D. EDIN.

THE object of the St. Andrews Institute for Clinical Research is the investigation of disease in its earliest stages. It is unquestionable that many of the vague disabilities of later life, as well as many grave diseases, have their origin in childhood; it is therefore obvious that the study of children's ailments gives promise of being the most valuable part of our work. It is only the general practitioner who has the opportunity of watching the first manifestations of illness in childhood, and it is only by his observations that it will ever be possible to understand the prognostic significance of what are at present regarded as trifling ailments.

### *The Opportunities of the General Practitioner.*

When I was starting work here I attended the out-patient department of a large children's hospital with the hope of observing the early symptoms of disease, but soon found that very little of the information I was seeking could there be obtained. I saw cases of advanced marasmus in infants, severe skin diseases, glandular swellings which had reached the stage where surgical interference was necessary, adenoids requiring immediate operation, mastoid abscesses, and so on. I was impressed by the great value of the work done and the skill displayed, but the vast majority of cases were end-results of disease which might surely have been prevented by earlier care. It must not be inferred that the general practitioner was to blame for this state of affairs; very probably many of the cases were not seen even by him till the necessity for prompt and skilled assistance had become obvious. It is impossible to-day to follow carefully the after-history of all children seen in the routine of busy general practice. A child suffers from a slight feverish attack of unknown nature and origin; a simple diaphoretic mixture is prescribed and the patient recovers quickly, it may or may not be by the aid of the medicine given. Similar attacks recur, and the doctor is not called in. Or a mild bronchitis is promptly relieved, and when succeeding attacks occur the mother repeats the mixture and all appears to go well. But the recurrence of such attacks may indicate some grave weakness, and when the doctor's services are next requisitioned a serious condition may be found.

Sir Robert Philip[1] states that in groups of Edinburgh school children examined at random 30 per cent. were found—after making full allowance for error and over-refinement of diagnosis—to show stigmata of tuberculosis, and he is of opinion that this is probably too low an estimate. Hamburger found that in post-mortem examinations—deducting those who actually died from tuberculosis—the frequency of lesions detected increased from 17 per cent. in those of 2 years of age to 53 per cent. in those between 11 and 14. Pottenger[2] makes the statement that probably 75 per cent. of all children have an infection before they reach the period of adolescence. Whether these statistics be accurate or not, they give good ground for the belief that many of the ill-defined feverish attacks in young children may be due to systemic intoxication resulting from bacillary invasion. Before school age the seed is very often sown, and, as Philip points out, the existing system of medical examination of school children is entirely misleading, as the returns refer only to obvious cases of disease. The slighter degrees of infection leading to systemic disturbance without definite physical signs can be studied only by the general practitioner. Tuberculosis has been taken as an illustration, partly because of its widespread and fatal nature, and partly because it is a subject to which we are giving special attention here, but what has been said about its early incidence applies to that of many other diseases.

### *Coöperation of Medical Practitioners.*

A research into the early symptoms of disease, if it is to be of any value, involves the coöperation of many workers. No one individual can cover a wide enough field, and personal bias is apt to lead to the giving of undue prominence to a particular line of inquiry as the result of some preconceived idea of its importance. The value of evidence is more than multiplied by the number of observers. The circumstances in which we work here are ideal, for all the general practitioners in St. Andrews are giving their assistance. Similar coöperation will, no doubt, be possible in all centres when its importance has been fully realised; it is to the benefit of all, not only in widening the field of opportunity for study, but in lessening the possibility of misunderstandings. Our difficulty has not been to ensure coöperation among the general practitioners, but to determine the principles on which to base our work and to evolve a satisfactory scheme for carrying it out. An adequate scheme cannot be devised at once; false starts are inevitable, but they are of educative value. We may not even now be on the best road, but we appear at least to be going in the right direction.

### *The Problems of Tuberculosis.*

It was decided that the investigation into the early symptoms of disease in children should have special reference to tuberculosis because of the outstanding importance of this subject. The activity of lymphoid tissue in the young and the frequency in them of tuberculous glandular infiltration naturally suggested to us a special study of this tissue and careful observation of all glandular enlargements. The importance of this line of investigation is generally recognised. Thus Philip[3] says: "If the more likely seats of lymphatic infiltration were scrupulously supervised in childhood and adolescence, the determination of tuberculosis at the lymphatic stage would be a common event. Persistent glandular enlargement in any area, however slight the degree of enlargement, should not be passed over lightly." Pottenger[2] says: "Recognition of early lymphatic tuberculosis is the key to the tuberculous problem."

### *The Nature and Functions of Lymphoid Tissues.*

Accordingly we undertook a preliminary study regarding the function of lymphoid tissue and the nature and development of lymphatic glands. We were met on the threshold by rather striking and unexpected difficulties, for the whole subject has been much less fully studied than one would naturally have assumed to be the case. Presumably from its activity in the young lymphoid tissue has some peculiar function. It is commonly supposed to be protective before the body cells generally have acquired a power of resistance to bacterial infection; its needless sacrifice should therefore be avoided. It is, indeed, not easy to understand how the lymphoid tissue situated in the mucous membrane itself and commonly called the "first line of defence" of the body can perform effectively the function of arresting bacteria that penetrate the surface, for it is not spread out in a continuous layer. Moreover, lymphocytes appear themselves to have the power of destroying the epithelial covering. Even when aggregated into masses, as in the pharyngeal and faucial tonsils, it would often appear—if judged from clinical experience alone—to be a source of weakness rather than of protection. The same may be said regarding the lymphoid tissue of the Eustachian tube—the "tube tonsil" as it has been named. The abundant lymphoid tissue of the vermiform appendix seems to be of very doubtful value, and it is the lymphoid tissue of the intestine which gives way to attack in typhoid fever.

### *Glands.*

Glands are said to form the "second line of defence" of the body, and their protective function is generally assumed, but they frequently break down under the

assault of germs and themselves become foci of disease. They may be physiologically enlarged as the result of protective activity, or pathologically enlarged to the detriment of the organism. It is no easy matter to distinguish these separate conditions. The whole problem of glands is a very intricate one, and many puzzling questions remain unanswered. For example, is a palpable gland in the neck an enlarged gland, and at what stage in infancy do normal glands become palpable in any situation? To what extent do glands vary in number and size in healthy individuals? Are new glands formed on comparatively slight stimulus, and do they disappear entirely when the stimulus is withdrawn? The necessary elements for their development are present in any loose connective tissue. Gulland[4] states that glands which have been removed are very readily replaced and that the newly formed glands are not distinguishable from the original ones after some time. Even the relationship between glands in various situations is not definitely established. Some observers[5] have maintained that the tubercle bacillus may enter through some part of the mouth or pharynx, possibly through a decayed tooth or through the tonsil, and track from gland to gland down to the root of the neck until the lung itself is affected by direct contact with a caseous gland; this has been given as an explanation of the occurrence of tuberculous infection of the apices. Woodhead and other observers believe that there is a direct lymphatic connexion between the deep cervical and bronchial glands, and that the tubercle bacillus may thus pass from the pharyngeal mucous membrane to the lungs. Shiga[6] states that tubercle bacilli, having reached the respiratory passages, are taken up by the leucocytes, pass through the mucosa into the lymphatics, and eventually reach the hilus glands by way of the glands of the neck. According to Still,[15] "direct extension of tuberculosis from cervical glands to those in the mediastinum, if it occurs at all, is extremely rare. Enlargement and caseation is progressively less in cervical glands from above downwards (affected from tonsil), but when mediastinal glands are affected in such cases they show as advanced changes as the upper cervical glands. Hence the latter were probably infected in the usual way through the lung." According to Cobbett,[5] "careful investigations of unselected material provided by children dying in general hospitals have shown that the bronchial glands are affected with tuberculosis, or tubercle bacilli, much more commonly than the cervical or mesenteric glands, and there, therefore, can no longer be any doubt that the lungs, even in young children, are a commoner portal of entry of tubercle bacilli in general than the intestine or pharynx." He states, further, that investigations have shown that it requires much larger doses to infect when the bacilli are swallowed than when they are inhaled. In animals the lungs present a marked contrast to other organs, in that they invariably yield copious cultures of bacteria, including moulds, &c.; and that these bacteria really get into the lungs with the inspired air there can be no doubt. The tissues and fluids of the healthy body, lungs excepted, are almost entirely free from living bacteria.

Calmette's[7] view is very different. Too much emphasis, he believes, has been laid on the respiratory route. Germs floating in the air are not often sufficiently numerous to be carried into the fine bronchial ramifications, the filtering action of the nasal and buccal mucous membranes being very effective; moreover, very small droplets do not as a rule contain bacilli, and numerous researches have shown that healthy lungs are nearly always aseptic. Most tuberculosis, from that of infants to that which occurs in adults, is derived from penetration of the intestine. The digestive tract is the principal path of invasion by the human as well as by the bovine bacillus.

With regard to the condition of lymphatic glands as an indication of the point of entrance, contrast the views of these two authors. According to Cobbett,[5] "if the lymph glands are such efficient filters as we have reason to believe, it seems probable that they will seldom, if ever, let a tubercle bacillus through their meshes without retaining in their substance a number of others sufficient to cause disease there and produce obvious lesions which will serve to mark the path along which the invaders penetrated into the body." According to Calmette, Cohnheim's law, which states that a cellular reaction always marks the site of invasion, is only true of individuals already infected. Unless this condition is fulfilled, or the dose of infection is truly massive, no cellular reaction indicates the presence of bacilli within a gland. Von Behring was the first to maintain the intestinal origin of pulmonary tuberculosis. Tubercle bacilli, he said, received in infancy may pass through the wall of the intestine and through the mesenteric glands, and so reach the lungs, without leaving any lesion in the abdominal cavity.

The recent work of Ferrán and Chabás is of interest in this connexion. They maintain that "even under laboratory conditions, when healthy animals are housed along with infected animals in cages whose walls and floors as well as the food are thickly smeared with living tubercle bacilli, tuberculosis will not occur in the uninfected unless they are permitted to drink water contaminated with their own excrement. Ferrán concludes from this that the tubercle bacillus is merely the end product or transmutation of an intestinal saprophyte, and that infection need not be feared as long as the tubercle bacillus is the only organism present" (Sorley[8]).

*Conjoint Clinical and Laboratory Investigation.*

An investigation has been undertaken in the bacteriological laboratory of the Institute and in the physiological laboratory of the University with the object of obtaining more accurate information regarding the reactions of lymphoid tissue to tuberculous infection, the power of resistance of the lymphocytes, and the course and extent of possible spread of infection by the lymphatics before there is general infection of the blood stream. From the clinical side we are carefully observing all glandular enlargements and co-relating them with the possible portals of entry of infection, and by prolonged study endeavouring to arrive at some conclusion regarding the nature of the infection in each case. There is a tendency at present to regard all glandular enlargements as evidence of tuberculosis, yet many of them disappear and leave no sign to support the view that they were associated with this disease. It is surely of importance to determine in what proportion of cases this is found to occur. These diverse views show how confused and inadequate our knowledge of the disease really is.

*Prognosis and Treatment in Tuberculosis.*

Preventive and curative treatment have as yet no sure basis, and our powers of prognosis are very feeble. Rational prognosis cannot be based on theories, however plausible. It can only be based on observation of facts. The present tendency is to base all our hopes oninoculation. Hereditary predisposition is now regarded as resulting merely from some special texture of the cutaneous and lymphatic apparatus, and not from the presence or absence of a specific hereditary impregnation with the bacillary products. Special stress is laid on the presence or absence of acquired immunity. Few individuals, it would appear, can hope to escape infection, and the slight infections to which we are all exposed in childhood may provide us with the power of resistance to later and more deadly attacks. In the opinion of Lyle Cummins[16] this conception of "infection and resistance" provides the master key to the whole question of tuberculosis.

Nathan Raw[9] believes that bovine and human tubercle will not live in the body at the same time, and that the one disease produces immunity from the other. He states that a child who develops primary abdominal tuberculosis with involvement of the mesenteric glands, or an infection of the neck glands, which are usually caused by the bovine bacillus in milk, is immune to infection by the human bacillus for the remainder of life, and that young adults attacked by the human bacillus, producing primary pulmonary tuberculosis,

are immune to bovine infections for the rest of life. Brownlee,[10] in a statistical inquiry published by the Medical Research Council, concludes that in districts where infection by milk is prevalent in childhood the "young adult" type of phthisis is rare. Bushnell,[11] agreeing with Calmette, holds that the time has now come when we must strive to substitute an artificial premeditated infection for the present infection by chance, though he admits that we have not sufficient knowledge to justify the attempt in the meantime. All children will in the future be vaccinated for tuberculosis.

Even now Shiga[6] advises that preventive inoculation with his Tb. serovaccine should be undertaken during the school age, and considers the following cases suitable for treatment: (1) those who have been exposed to infection within their family circle; (2) those of consumptive appearance, as, for example, the anæmic and debilitated, and those of weakly constitution: (3) those with chronic tonsillitis or chronic cervical adenitis; (4) those who easily catch colds and have a continuous slight fever; (5) those who from time to time suffer from slight fever of uncertain origin, or whose temperature rises slightly after moderate exercise; (6) those, finally, in whom rough or diminished breath sounds are found on auscultation. He regards von Pirquet's reaction as a necessary preliminary to inoculation, and considers a marked reaction as a favourable indication for vaccinotherapy.

*The Scope of the St. Andrews Scheme.*

It became evident to us that even if the inquiry were concerned solely with the investigation of tuberculosis its scope must be very wide. All symptoms indicative of toxæmia must be included, and though there appears to be a great similarity in these symptoms whatever may be the nature of the toxin, it is probable that the differences are quite distinguishable if we were trained to observe them; only by the study of such vague and indeterminate symptoms can the earliest onset of any disease ever be detected. No pre-supposition as to the probable outcome must bias observation the inquiry must include all children, of all types and in all circumstances, who show the earliest symptoms of departure from health. It is impossible to isolate any clinical investigation so as to deal with the origin and onset of tuberculosis alone.

It may be said that to obtain sufficient material for investigation a wider field than St. Andrews is necessary. Experience has already proved the contrary. Complete and methodical examination of a limited number of cases is worth much more than incomplete investigation of a very large number. To keep in touch with all our cases and to analyse our records is already a very heavy task. The suitability of St. Andrews for our work was emphasised by Sir James Mackenzie when the Institute was projected; all classes of the community are represented and the population is not migratory. The material is ample for the members of our staff, and we have been compelled to give up, in the meantime, any idea of linking up a larger district by the aid of outside practitioners.

The ideal at which we aim is to obtain records from birth onwards of all St. Andrews children—all children of all classes. No similar attempt has ever been made. If the investigation were made among children of the poor alone it would not be of anything like the same value. Surroundings undoubtedly play a great part in the causation of disease, but how great a part can never be known if statistics are confined to one class only in a community. Even such diseases as marasmus and rickets are not confined to the poor; faulty dieting is common enough among the well-to-do. Moreover, rickets occurs in circumstances which make it difficult to believe that it is essentially a deficiency disease due to the lack of an antirachitic factor in milk-fat. This may be the main factor in most cases, but other factors must be considered, especially the absence of fresh air and of cleanliness. The investigations of Noël Paton[12] and his collaborators in Glasgow have called attention to their importance. In young dogs under ordinary laboratory conditions a liberal allowance of milk-fat neither prevents the onset of rickets nor cures it when it has developed. Cubic space is important in a house, but the mere calculation of cubic space may not lead us to the chief element at fault in the surroundings: there is more in a mother's management of a family than is generally realised. It is possible to find a large number of healthy children in a poor and crowded house and a few weaklings in a mansion.

*The Methods of the Scheme.*

In order to make our records complete it is necessary to have the coöperation of all the doctors and nurses, and, what is equally important, the intelligent coöperation of the parents. All the practitioners of St. Andrews are on the staff of the Institute, and through them we ensure the help of the nurses. The main difficulty is to get the help of the parents, but it is lessened by the fact that each mother deals directly with her own doctor only; there is no inspection by an official doctor and no suspicion of any outside interference. This is a most important matter, for the poor have a perfect right to resent what would not be tolerated by the well-to-do. Children brought to the Institute are examined by the family attendant himself, or jointly by him and some other member of the staff who is present by his request, and with the consent of the parents. When the cases are read at the weekly meetings they are numbered, not named. Our methods bear no resemblance to those of a hospital out-patient department. The fact that we have acquired the confidence of the community is shown by the number of our cases.

*Coöperation of Parents: Weight Charts and Child-welfare Centre.*

The real difficulty is to ensure that the mother will call in the doctor when the child begins to show the first symptoms of illness. We have endeavoured to get over this difficulty in connexion with infants under one year by distributing weight charts through the doctors and nurses, and by impressing on the mothers that regular weekly weighing of the baby is necessary in order to detect those early signs of failure of nutrition which call for a doctor's services. They are appreciating this and showing interest in the weekly records. The doctor or nurse takes the weight at birth, a handy spring balance being now part of the equipment of each doctor's bag. The nurse who will be in charge of the child-welfare centre is at present giving us much assistance in cases where want of intelligence or carelessness on the part of the mothers might lead to faulty or incomplete returns. When the child-welfare centre is in full working order we shall have much assistance from the work done there, for though we do not consider it advisable that the Institute should be regarded as having any direct control in the matter of its management and the nature of the treatment prescribed, the physician in charge, being one of the local practitioners, will necessarily be a member of our staff. The weight chart is of handy form, and is spaced for 52 weeks. At the side and on the back is sufficient room for short notes made by the doctor or nurse from time to time.

*Examination of Infants: The Infant's Card.*

We have drawn up cards containing a number of queries with regard to infants which the doctors will fill up in all cases. It is necessary to ensure uniformity in the observations made; whether the items selected are the most suitable can only be determined after further experience. The value of many at least of the queries is sufficiently obvious; for example, the weight at birth, whether or not the child is premature, and whether it presents any abnormality. It would have been well to leave a space for description of the nature of the confinement; it would be interesting to know whether the alarming condition of the baby sometimes seen after the employment of "twilight sleep" has any prejudicial effect on its subsequent

progress. The length is of importance, and should be taken from time to time, as the ratio between growth and weight is a fairly constant one in normal conditions. Any ill-health of the parents and of other children is noted, and the existence of any tuberculous heredity on either side. We classify surroundings as good, fair, and bad. This is vague, but much must be considered in addition to number of rooms and cubic space; general evidence of good management may rightly modify our opinion of a small house. We leave it open to the doctor to judge of all the circumstances before coming to a decision. I have recently seen a large family in two small rooms in a dilapidated house who were all fairly healthy. If I had found them all showing such signs of disease as rickets and enlarged glands the cause would have been regarded as perfectly obvious. Discovery of good health in a bad house is as valuable an observation as the discovery of disease, but is apt to make much less impression on the mind. Efforts by the parents to make the best of bad circumstances by good management may be much more successful than is generally considered to be possible.

If the child is not breast-fed the nature of the substitutes is noted and the dates at which they were given. It is unnecessary to point out how impossible it often is to find out exactly what some mothers are giving to their children. If unsterilised cow's milk is given we note the source of the milk; it is our intention to have bacteriological examinations made at the laboratory from time to time, and also to have the mother's milk analysed in cases where it is suspected to be of poor quality. In the consideration of gastro-intestinal disturbances in infants and children it is of the utmost importance to consider all associated symptoms with great care. The disturbance may not be due to an error in diet at all; the diet may be not theoretically perfect, yet of a kind which we have known to suit many other children. The disturbance may be purely reflex, and the primary mischief may not be in the stomach or intestine at all. The symptoms of a pulmonary catarrh may be overlooked because of the prominence in the picture of the secondary gastro-intestinal symptoms. Meticulous tinkering with the diet will not carry one far in such cases. Want of rest and excitement, due to the fussy attentions of a mother or nurse, may upset a child's digestive system. We know that excitement may cause diarrhœa in an adult, and worry may bring the functions of the digestive system almost to a standstill. The diverse views on the value of many foods—apart from gross errors—indicates that the solution does not lie entirely in percentage proportions and calories.

We consider it highly important to note the time and circumstances of the earliest onset of various common ailments, and have selected for special observation catarrhs (respiratory and gastro-intestinal), nasal obstruction, ear trouble, and glandular enlargement. A short account of any special illness can be given on the back of the card. By means of these cards and the weight charts we hope to obtain a fairly full record of the health of infants during the first year of life.

*Details Recorded on Infant's Card.*

Date, name, address, doctor.

(1) Weight at birth, (2) length, (3) mature or premature, (4) any abnormality, (5) health of parents, (6) any tuberculous heredity, (7) number and health of previous children, (8) surroundings (good, fair, bad), (9) breast-fed or not, (10) if not, what substitutes given and when, (11) source of milk-supply.

Onset of (12) catarrhs (respiratory and gastro-intestinal), (13) nasal obstruction, (14) ear trouble, (11) glandular enlargements, (15) any other ailment.

Notes of any special illness and after-history over-leaf.

*Examination of Children: Children's Card.*

We have prepared similar cards for the examination of older children. When a doctor is called in for any illness he notes the various points mentioned on the card quite apart from that special illness. It may be wondered how the doctor will obtain opportunity of seeing children between infancy and school age unless he is called in on the occasion of serious illness; we hope that with the opportunity of closer examination of the children during the first year of life he will be better able to estimate the prognostic significance of any illness, and that the mothers' intelligent interest will make them readier to call for his advice. Further, the nurses will have gained the confidence of the mothers, who may often ask their advice regarding the need for the doctor's services; this is already occurring in St. Andrews. It is useless to ignore the fact that expense is frequently the cause of the mother's reluctance to send for a doctor; she desires to be assured of the necessity before spending money which she thinks might be better spent in procuring food and necessary comforts for her children.

*Details Recorded on Children's Card.*

Date, name, address, doctor.

(1) Glands, especially deep superior cervical—palpable or enlarged, (2) tonsils (normal, enlarged, unhealthy), (3) teeth, (4) nostrils (free or obstructed), (5) ears (earache or discharge), (6) diet, (7) failure of nutrition, including loss of muscle, (8) tendency to catarrhs, (9) exhaustion—disinclination for effort, (10) anæmia, (11) temperature—especially irregularities without obvious cause, (12) pulse—especially persistent rapidity and softening.

X ray examination of chest in all cases of glandular enlargement; blood examination in all cases of pallor; urine examination at Institute in all cases of failure of nutrition.

The condition of glands, tonsils and teeth is obviously very important. The enucleation of tonsils simply because they are enlarged is surely a most unscientific procedure. Enlarged tonsils often present a healthy appearance, yet from their size alone they may no doubt cause a certain amount of harmful obstruction. On the other hand, there may be purulent discharge from the crypts of tonsils of normal size. The deep superior cervical glands are selected for special note because of their close relationship to the tonsils and pharynx. We note carefully the condition of the nostrils in order to observe the onset of obstruction. No doubt complete nasal obstruction is commonly associated with the presence of adenoids, but what are the conditions which lead to this hypertrophy and degeneration of the lymphoid tissue of the naso-pharynx? It is reasonable to consider that the nasal obstruction due to recurrent attacks of coryza, with swelling of the nasal mucous membrane, may lead to defective aeration of the nasal passages, the accumulation of secretions, and decomposition due to microbic infection. Adenoids might possibly be prevented by simple attention to the condition of the nose from the earliest stages of life. When this obstruction occurs the Eustachian tube becomes involved, and it is the channel through which infection is conveyed from the naso-pharynx to the middle ear in cases of suppurative otitis media. Urbantschitsch drew attention long ago to the existence of Eustachian salpingitis in every case of chronic middle-ear suppuration. Further, tuberculosis of the middle ear is not uncommon in the infant, the tubercle bacilli no doubt finding their way along the Eustachian tube. Douglas Guthrie[13] states that in a children's clinic for ear and throat disease 90 per cent. of cases are tonsil-adenoid disease and middle-ear suppuration. The amount of suffering and ill-health which the prevention of such conditions would abolish demands attention to the earliest onset of symptoms with the hope that simple measures may then be effective. Lewin[14] points out that children are rarely taught to attend to their noses, and are allowed to acquire the habit of sniffing up discharges instead of blowing their nostrils free. Sprays and lotions are resorted to when the mischief has been done, and are troublesome and often ineffective. She suggests that very simple early measures might abolish the necessity for their use.

Tendency to catarrhs need not be dwelt upon, except to point out that they may lead to the formation of the suitable soil for the growth of the tubercle bacillus, if they are not indeed the indication of an underlying tuberculous infection. The whole relationship of respiratory catarrhs to tuberculosis has

never been satisfactorily investigated. With regard to diet, it is manifestly impossible to calculate the calories in the daily diet of individual children whose food is not accurately estimated at every meal. The digestive organs of normal children can deal within reasonable limits with many varieties of diet.

What we aim at recording is the manifest excess or privation of the various elements considered necessary in all diets, and to note the types of diet in common use among children of the various classes of the community, and to compare their apparent results. In noting failure of nutrition we observe the want of muscle substance and loss of muscle tone. "Tuberculosis toxins would seem to act specially on neuro-muscular structures. The dystrophic influence is seen in the progressive loss of sarcous substance and associated enfeeblement and irritability of muscle. Hence early manifestation of motor weakness, both of limbs and of viscera—the feeling of tiredness, the disinclination for effort, the softening of pulse, and the gastro-intestinal sluggishness. These are generally in evidence long before cough or expectoration or other indication of local lesion is forthcoming ..... loss of muscle counts in tuberculous intoxication rather than loss of fat. Patients with advanced tuberculous intoxication may have abundance of adipose tissue" (Philip[3]).

It is with the object of testing such statements and of finding out whether or not they form any guide to the differentiation of tuberculous from other toxins that we draw attention to them in the investigation of failure of nutrition. Sir James Mackenzie has clearly demonstrated the existence of muscular rigidity in connexion with underlying visceral disease and its value in diagnosis. Pottenger [2] affirms that in tuberculous disease of the lungs muscular rigidity may be detected. The spasm, he says, varies in position with the lesion; if in front, the sterno-mastoid, scaleni, pectorals, and intercostals are affected; if behind, the trapezius, levator anguli scapulæ, and rhomboidei. So far we have not found this borne out in our examination of early cases of phthisis, but it is well to bear the statement in mind and to continue to test its worth. Exhaustion is always a sign that a child is not well. Already we know that there are various types of exhaustion, possibly distinctive of different toxæmias. Another hopeful field is the investigation of anæmias. It is quite impossible to estimate the severity of an anæmia by the appearance of the patient, or even in many cases to determine whether or not anæmia is present. Therefore in all cases in which pallor is a symptom we are having blood examinations made at the Institute. If time permitted of this, we believe that valuable information might be obtained by the routine examination of blood in all cases of illness in children. Something distinctive in the way of blood pictures might be found in connexion with the onset of various diseases. It is unnecessary to insist on the necessity for observing irregularities of temperature which may be slight and therefore overlooked. The condition of the pulse must be carefully observed in all its aspects. Rapidity and softening, by which is meant loss of tone with apparent fullness of the artery and feeble impulse communicated to the examining finger, are always suggestive of an active toxæmia. X ray examination of the chest is made in all children with glandular enlargement, with the object of observing, as far as may be possible, the condition of the mediastinal glands and the state of the lungs. We are also examining the chests of a number of healthy children; without a knowledge of varieties in the normal, which have not yet been sufficiently investigated, it is impossible to recognise and interpret the abnormal. Urine examinations of a somewhat more elaborate nature than is possible in every-day practice are made in the chemical laboratory in all cases of failure of nutrition.

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(*Continued at foot of next column.*

A CASE OF

# POISONING BY CANTHARIDIN.

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THE following case of poisoning by cantharidin, the active principle of cantharides, seems worth recording, as it may help to throw a little light on inflammations of the kidney. I can find no record of any other case in which cantharidin itself has been taken.

At about 4 P.M. on June 7th, 1921, a medical student tasted, out of misplaced curiosity, some crystals of cantharidin; no unpleasant taste was noticed. He stated that he took as much as would go on a pin's head—almost certainly at least one-fiftieth of a grain. As tincture of cantharides contains only 0·01 per cent. of cantharidin, this would be the equivalent of about 220 minims of tincture of cantharides, or over 40 times the maximum pharmacopœial dose. Shortly afterwards the patient had tea, including some bread and butter. About 7 P.M. he noticed pain in the left lumbar region, shooting round to the front, but not very severe. A few hours later he felt much slighter pain in the right lumbar region. At 8 P.M. he began to pass urine in small quantities about every quarter of an hour; there was some pain on micturition. At 9 P.M. he began to feel unwell and noticed blood in his urine; this increased in quantity later. During the night he micturated only five or six times and obtained some sleep. About 3 A.M. next day he vomited twice. In the morning he came to St. Bartholomew's Hospital and was admitted to the wards; he was then passing urine containing blood about every two hours, and he still complained of lumbar pain, mainly on the left side.

*On admission* he looked pale and rather anxious; his mouth and tongue were not at all blistered. Nothing abnormal was discovered in his chest, his blood pressure was 125 mm. Hg (systolic) and 80 mm. (diastolic). There was tenderness on deep palpation in the left lumbar region; no œdema anywhere. His temperature was 99·6°F., his pulse 120, his respirations 24. He gave no history pointing to previous nephritis; he had never, to his knowledge, had scarlet fever. The urine was red in colour and acid; it contained 0·64 per cent. albumin (Aufrecht), large numbers of red blood cells, and no more leucocytes than could be accounted for by the amount of blood present; no casts or epithelial cells were seen.

On the 9th the patient's condition had improved; his pain was less. 53 oz. of urine were passed (intake 84 oz.). There was still much blood, but polymorphonuclear leucocytes were nearly as numerous as red cells. Two red-cell casts were seen, but no other casts. His temperature was down to normal; he passed a dark green stool, which was negative to benzidine. On the 10th he passed 27 oz. urine (intake 50 oz.). On the 11th he looked less well and passed only 20 oz. (intake 68 oz.). This still contained much blood and a few red and white celled casts; the albumin was 0·1 per cent.

The patient's condition then began to clear up rapidly. By the 13th he was passing 43 oz. of urine, which contained no blood microscopically (intake 70 oz.). There was only a faint haze of albumin. By the 15th no albumin could be detected. In the centrifuged deposit three red cells were seen, fair numbers of leucocytes and many casts, mostly hyaline, a few epithelial and granular. By the 20th no red cells and no casts could be found, and only a few leucocytes. Throughout the course there was no headache, no mental symptoms.

(*Continued from previous column.*)

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no aphrodisiac symptoms or œdema. The blood pressure remained constant (125 mm. systolic, 80 diastolic). The blood count on the 10th showed 6,150,000 red cells and 11,000 leucocytes per c.mm.; hæmoglobin 94 per cent.; there was no departure from normal in the differential count.

*Treatment.*—The patient took fluids very freely until admission; he was then limited to 2½ pints of fluid and no solids for 24 hours; he was given 4 oz. of lactose daily. On the 10th the fluids were increased to 3½ pints and he was allowed plentiful carbohydrates. Fats were added on the 13th and limited proteins on the 14th. He got up on the 24th and was discharged on the 28th.

*Tests for renal function.*—For four or five days after the patient's admission each specimen of urine passed was kept and tested separately. On admission the diastase content of the urine was low (5 units), but the patient was then drinking much fluid. Next day it was 20 units, and specimens tested during the next four days always contained between 10 and 20 units. Only one other specimen, on June 13th, gave a reading as low as 5 units. The blood-sugar was at first on the low limit of normal (0·085 g. per 100 c.cm. on admission), while the urinary sugar was 0·032 g. per 100 c.cm. But by 11th the blood-sugar had risen to 0·136 g. per 100 c.cm.; and the sugar in urine in g. per 100 c.cm. was in different specimens 0·080, 0·100 on the 9th; 0·120, 0·109, 0·106 on the 10th; 0·116, 0·122 on the 11th; 0·141 on the 12th; on the 13th it had fallen to 0·096 and 0·092. The sugar was estimated by Dr. R. L. Mackenzie Wallis, using his method for normal urinary sugar; the normal limits by this method are 0·06 to 0·08 g. per 100 c.cm. It must be remembered that over this period the patient was taking 4 oz. of lactose daily as well as other carbohydrates later, and the figures must be compared with the quantities of urine passed.

On admission the urea in his urine was 0·8 per cent. It was not thought justifiable to test his excretion of urea or iodides during the acute stage. His blood-urea on admission was 30 mg. per 100 c.cm.; 36·5 mg. per 100 c.cm. on the 11th—i.e., well within normal limits.

The patient was seen again on July 22nd, 1921, after a holiday. His urine contained no albumin, and no casts, red or white cells were seen in the centrifuged deposit. His blood count showed 6,600,000 red and 7400 white cells per c.mm. His blood pressure had, however, risen to 140 mm. (systolic) and 95 mm. (diastolic). A few weeks later his blood pressure had fallen to 112 mm. (systolic).

*Discussion.*

The case presents several interesting features, especially as regards the kidney lesion:—

1. The absence of vesication in the mouth and the relatively slight damage after a comparatively large dose of cantharidin suggests that not all of it can have been absorbed; cantharides, however, takes some time to blister. Much worse damage has followed the taking of a relatively smaller amount of tincture of cantharides in which the presence of chloroform as a solvent would perhaps assist the absorption of the cantharidin. Possibly in this case the butter taken with the patient's tea helped the absorption of the drug.

2. The rapidity with which the condition cleared up is worthy of note.

3. The signs and symptoms are those of a glomerular nephritis. Of particular note in this connexion are: (*a*) absence of œdema; (*b*) no great reduction in the fluid output; (*c*) hæmaturia with large numbers of leucocytes in the urine, moderate numbers of casts soon disappearing; (*d*) normal blood-urea; (*e*) normal diastase output; (*f*) a blood-sugar on the lower limits of normal (at first) with a urinary sugar on the upper limits of normal. It is as yet too early to lay much stress on this.

I am indebted to Dr. J. H. Drysdale for permission to publish the clinical details and to Dr. Mackenzie Wallis for permission to give the results of his investigations into the chemical pathology.

DISABLED SOLDIERS' AND SAILORS' WORKSHOPS CHARITY.—A subscription dance is to be held at Rectors on Wednesday, Nov. 16th, under the auspices of the Disabled Soldiers' and Sailors' Workshops Charity. The dancing salon has been given for the evening by the management, and the Duchess of Sutherland has consented to act as hostess. Price of tickets, if purchased before Nov. 16th, £2 each; if purchased on that day, £3 each. Tickets, and any further information desired, can be obtained from the Hon. Organiser, 177A, Kensington High-street, W. 8; remittances should be made payable to the Duchess of Sutherland.

# Reviews and Notices of Books.

## BIOCHEMISTRY.

A Study of the Origin, Reactions, and Equilibria of Living Matter. By BENJAMIN MOORE, M.A., D.Sc., F.R.S., Whitley Professor of Biochemistry, University of Oxford. London: Edward Arnold. 1921. Pp. 340. 21*s*.

Prof. Moore defines biochemistry as the study of the chemical substances produced by biotic energy, or the energy of life, in the bodies of living plants and animals, and the further study of the energy processes by which such substances are elaborated and used subsequently to their production for carrying on the life of the cell. The living cell and its energy exchanges are subject to physical and chemical laws, but the peculiar structure of living matter is inhabited by a type of energy not producible in the absence of life. The theme of the book is biotic energy. We have before us all the author's views on this subject. Though not accepted in their entirety by his colleagues, these views afford material for consideration and thought, as well as for further investigation.

Part of the book is a reprint of some of the author's papers in the Proceedings of the Royal Society and part is a re-edition of his contributions to Advances and Recent Advances in Physiology. The book is not a text-book on the subject. The reader must already be acquainted with the elements of physical and organic chemistry so as to follow the reasoning of the author. The papers reprinted from the Proceedings of the Royal Society are those on the origin of life. Life originates by the catalytic action of certain hydroxides, such as that of iron, upon the traces of carbon dioxide in the atmosphere. Light energy is converted into chemical energy by the reduction process to formaldehyde. Further chemical energy arises by the reduction of nitrates to nitrites in water by the action of light. Through the agency of the chemical energy so produced complex organic compounds are built up by unknown stages and ultimately the chloroplast as a special energy transformer. The small supply of nitrates, insufficient for existing life, can be supplemented by the conversion of atmospheric nitrogen by certain algæ. The living cell is peculiar in its special structure, consisting of a mixture of colloids and crystalloids in common solution in water. This mixture is endowed with an aggregate of physical properties and thus differs from a simple colloid like starch or albumin. Hence the cell has biotic energy. Living matter acts as a transformer between biotic energy and other forms of energy. All the energy is supplied by changes arising from chemical reactions in solution and they are initiated and controlled by the substances in the cell and in its secretions.

In Chapter XIV., on Secretion and Glandular Mechanisms, the most interesting section in the book, Prof. Moore explains the inner working of the cell. He argues thus: Since a really impermeable membrane does not exist and no animal cell has been proved to possess even a semi-permeable membrane, the peculiarity of the presence of excess of potassium in the cell and of excess of sodium in the plasma must be attributed to an active process of selective absorption against osmotic pressure. The cell structure has a definite affinity for the different ions; each ion passes in and out, but only in accordance with the affinity; the amount that passes through in either direction may be so small that it is not detected by chemical means. The work done in the secretion of urine can only be determined by reference to each constituent separately. In the case of urea, the concentration in the urine is over fifty times that in the blood, of sodium chloride scarcely double. By using a suitable formula the work done in their secretion is represented by 1214 calories per day. The chapter concludes with an excellent description of Pavlov's work on the connexion of the nervous system with secretion

and with the discovery of secretin by Bayliss and Starling.

The deeper insight into the mechanism of the function of the cell given by Prof. Moore cannot fail to be of benefit to mature workers. Whether students will be able to appreciate this presentation of the subject must depend upon their previous scientific equipment.

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BRIGHT'S DISEASE.

*Praxis der Nierenkrankheiten.* By Prof. L. LICHTWITZ, Altona. (Fachbücher für Arzte. Vol. VIII.) Berlin: Julius Springer. 1921. With 33 illustrations. Pp. 252. M.45.

IN this monograph Prof. Lichtwitz establishes his position among the leading continental authorities on diseases of the kidneys; it is not only a guide to a subject of considerable difficulty, but it is also an exposition of the author's own point of view based on his personal experience. The subject is approached along orthodox lines, and in the opening pages a summary is given of the main principles on which other workers have attempted to base their classification of diseases of the kidneys. In its main outline Prof. Lichtwitz's classification follows that of Volhard and Fahr; at the same time he accepts Aufrecht's point of view in emphasising for classification purposes the importance of the primary site of the disease process in the kidney. The anatomy of the kidney is shortly reviewed and its physiology is well summarised in its relation to medicine.

The best and most important section of the book deals with the crucial signs of kidney disease. The author's critical remarks on the significance of albuminuria, cylinduria, red and white blood corpuscles and epithelial cells in urinary deposits are worthy of the closest study and attention. In the functional tests of renal efficiency Lichtwitz makes a sharp distinction between the secretory and concentrating power of the kidney, since these functions are performed by different parts of the renal epithelium. He gives a standard renal-test diet, to which on successive days ¾ litre of water, 10 g. sodium chloride, and 20 g. urea are added. The urine passed during the day, from 8 A.M. to 8 P.M., is collected in two-hourly periods; the urine passed during the night is collected together and makes the seventh specimen of the 24 hours. For practical purposes it is sufficient to measure the volume and specific gravity of the separate specimens, and to estimate the urea and sodium chloride only in the total quantity of the 24-hour period. A table is given by which the amount of salt and urea output may be roughly calculated from these simple data. Prof. Lichtwitz would limit the use of the term renal insufficiency to disturbance of the power of concentration. Renal insufficiency always leads to an increase in the non-protein nitrogen in the blood and tissues. Non-protein nitrogen retention is an important sign in diagnosis and as an index of the course of the disease, but it is not proportional to the degree of renal damage and cannot, as Volhard has suggested, be used as an index of comparison between different cases.

The extra-renal signs of Bright's disease (incorrectly termed "Die Nierenfolgen"), namely—œdema, raised blood pressure, cardiac hypertrophy, arterio-sclerosis, uræmia and anæmia—are perhaps too theoretically discussed for a practical book. The author accepts a twofold relation of raised blood pressure to kidney disease; on the one hand he speaks of the association of nephritis with raised blood pressure, and on the other he recognises the sequence of: raised blood pressure—arterio-sclerosis—renal sclerosis. In the description of the clinical types the morbid anatomy and histology are briefly stated, more attention being given to the ætiological aspect. Nephrosis (or toxæmic kidney) is dealt with in detail and the "Genuine Schrumpfniere" (primary granular kidney) is dismissed rather briefly. In general, however, the clinical aspect is carefully and ably reviewed from the present-day standpoint.

The book is a masterly introduction to the newer pathology and treatment of diseases of the kidney. It has throughout a practical interest that ensures it the widest recognition.

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ALFRED NEWTON.

*Life of Alfred Newton, Professor of Comparative Anatomy, Cambridge University, 1866–1907.* By A. F. R. WOLLASTON. With a Preface by Sir ARCHIBALD GEIKIE, O.M. London: John Murray. 1921. Pp. 332. 18*s*.

THIS is a delightful book about a man who was also delightful in many ways. In his obstinacy, his hatred of any change, his whole-hearted aversion towards publishers, reviewers, popular natural history publications and their writers, his kindliness, his love of work and meticulous accuracy, he must in many ways have resembled Samuel Johnson, and another whimsical and very real naturalist, Charles Waterton. Though nominally a comparative anatomist, Prof. Newton's actual position in the scientific world was that of an ornithologist, and to the study of ornithology he devoted his life. It was in 1865 that the University decided that the study of comparative anatomy should be removed from the school of the professor of anatomy and should be combined with a professorship of zoology, the two making a new chair. The first election took place in 1866, the candidates being W. H. D. Drosier, M.D., of Caius, and Alfred Newton, M.A., of Magdalene, the latter being successful. Newton had previously been well known for researches in ornithology; for six years after his matriculation in 1848 he was elected to the Norfolk Travelling Fellowship, whereby he was able to make ornithological journeys in Lapland, Iceland, the United States, and the West Indies. He was much interested in the question of the extinction of birds, and with infinite labour collected notes and information about the great auk or gare fowl and the great bustard, with the intent to write two books, "The Story of the Gare Fowl" and "The Bustard in Britain." But his passion for accuracy and completeness made him dissatisfied with his material, and neither book arrived at publication. Incidentally we may mention that Mr. Wollaston says that it was Newton's inquiries into the matter of the great auk which led Kingsley to refer to that ancient bird in "The Water Babies." Part of Newton's duties as professor was to give courses of lectures in zoology, but he was never happy as a lecturer, and, as he himself says, knew that he was one of the worst of lecturers, but he devoted himself with great ardour to the museum, and was always on the look-out for specimens to add.

One of the most interesting portions of the book is that dealing with Newton's views as to other ornithologists and naturalists. "Two of a trade never agree," says the proverb, a sentiment which is as old as Hesiod, and Newton's remarks about Gould, Buckland, who was "wanting in every essential of a naturalist, except zeal," and Seebohm are just as good reading as Waterton's remarks upon Swainson and Audubon, but both Newton and Waterton were in the right. Mr. A. C. Benson's description of the trials which Newton underwent when music was introduced into Magdalene College Chapel, together with a collect from the office of Compline raises a smile, and his agonies when an ibis with a scarlet head appeared among the Chorus of Aristophanes's *Birds* are described with great vividness. In 1907 he died, and Mr. Wollaston gives us his almost last letter, written to his friend Mr. Harvie Brown (p. 291), a letter which in its modesty, its thankfulness for a happy life, and the gift of friendships sums up the whole man. He was, to use Sir A. Geikie's words, "one of the most eminent ornithologists of his day," and his Dictionary of Birds is a monument of industry and knowledge.

## ANATOMY OF THE HUMAN ORBIT AND ACCESSORY ORGANS.

By S. ERNEST WHITNALL. Oxford Medical Publications. London: Henry Frowde, Hodder and Stoughton. 1921. Pp. 428. 35*s*.

BEFORE his appointment to the chair of Anatomy at McGill University Dr. Whitnall had been a frequent contributor on orbital matters, large and small, to the Proceedings of the Anatomical Society, and he has now brought together these notes and fitted them into their appropriate places in a large work dealing with the anatomy of the region. In doing this he has enriched English medical literature, for this book is a veritable work of reference and a collection into English of the scattered results of investigators of all nationalities. The excellent bibliography at the end is an indication of the extent of his researches. The subject is not treated in any narrow sense, but includes the anatomy of the neighbouring parts, such as the accessory air-sinuses and the central connexions of the orbital nerves, abnormal muscles, and intracranial sinuses. We note in this connexion that Prof. Whitnall does not describe a vena centralis posterior. The illustrations, which are numerous, are mainly from photographs and are an excellent feature of the book; we would like to see some of these clarified or replaced by line diagrams, however, for it must be recognised that photographic illustration has its limits.

Altogether it is a book on which all the parties to its production are to be congratulated, and it will be in demand among students of ophthalmology.

## MEDICAL GYMNASTICS AND MASSAGE.

*Notes on Diseases Treated by Medical Gymnastics and Massage.* By Dr. J. ARVEDSON, Arvedson's Gymnast Institute, Stockholm. Translated and edited by MINA L. DOBBIE, M.D., B.Ch. London: J. and A. Churchill. Pp. 280. 8*s*. 6*d*.

WHEN Dr. Dobbie produced her translation of Kleen's "Massage and Medical Gymnastics," it was the hope of those interested in medical gymnastics that she would continue her labours and translate this little book of Arvedson's, which has been a standard work throughout Scandinavia for the last 20 years. Certain inherent difficulties faced the author, for, in the first place, as the title indicates, the book is intended merely to present to the student notes on diseases, not to give a full description of them. In other words, the work is an epitome. Then, too, we are told in the preface that the book is intended to be read in conjunction with Kleen's handbook. The task of producing a satisfactory book on these lines is obviously great; but, when due allowance is made, there remain points for criticism. The book is designed for the use of students, and accuracy should therefore have been its keynote; yet errors abound.

Take Chapter VII., which deals with Diseases of the Nervous System. On the first page allusion is made to various movements with the object of bringing back arrested menstruation. Apoplexy is said to follow hæmorrhage from a vessel in the brain or its membranes, and we regret to note in the treatment of the result of hemiplegia that little distinction is drawn between true passive movement and forced movement. We are told that thrombosis in cerebral vessels is usually due to arterio-sclerosis; and the definition of ataxy as "inability to innervate the muscles accurately and sufficiently to perform a movement, so that it is performed uncertainly," is hardly satisfactory. The value of stretching the back in cases of tabes is not mentioned. It is definitely stated that there is no disturbance of the bladder in patients suffering from disseminated sclerosis, although precipitate micturition is recognised as one of the earliest symptoms.

On the ethical side, the author says that "orthopædic treatment is often necessary for these patients, and it is important that the gymnast should not waste time by opposing such treatment, but should instead explain the necessity of it, and insist upon it when it has been advised by the doctor." Such advice would hardly be required by gymnasts in this country.

In dealing with neurasthenia, little stress is laid on the fatigue element in its causation, and, although we read that these patients "must not be tired," the table advocated for the treatment of a neurasthenic patient seems to us far too severe. It is unusual to class such complaints as migraine and trigeminal neuralgia under the heading of rheumatism of the neck; and no mention is made of cervical rib as a possible cause of brachial neuritis, or of sacro-iliac strain as a cause of referred pain in back or legs. And there are astounding omissions, since adenoids and displaced cartilage in the knee are not mentioned, while it is entertaining to learn that roast beef and bacon are classed amongst foods "easily digested" by the chronic dyspeptic.

These are grave drawbacks for the learner. But the arrangement of the book is admirable, dealing as it does in turn with the morbid changes, the causes, symptoms, and treatment of each complaint in turn; and, were it revised so as to bring the medical aspect into accord with the teaching of the schools, its value would be great indeed. The style is clear and the translation excellent.

*The Theory and Practice of Massage.* Third edition. By BEATRICE M. GOODALL-COPESTAKE, Teacher of Massage and Swedish Remedial Exercises to the Nursing Staff of the London Hospital. London: H. K. Lewis and Co., Ltd. Illustrated. Pp. 270. 12*s*. 6*d*.

FOR the most part this third edition is an exact reproduction of the second, but a short chapter on muscle re-education has been added which should prove a valuable addition to the work. Two new plates are inserted, of which the one showing types of enteroptosis as seen with the opaque meal explains to the student the nature of the condition far better than any words.

## SURGERY OF THE UPPER ABDOMEN.

Second edition. By JOHN B. DEAVER, M.D., Sc.D., LL.D., F.A.C.S., Barton Professor of Surgery, Pennsylvania; and ASTLEY P. C. ASHHURST, A.B., M.D., F.A.C.S., Associate in Surgery, Pennsylvania. Philadelphia: P. Blakiston's Son and Co.; London: H. K. Lewis and Co., Ltd. 1921. Pp. 832. £3 10*s*.

INASMUCH as no part of surgery has been more discussed of late than the lesions of the upper abdomen, an adequate text-book considering the whole subject will be welcomed. This volume is certainly the most complete treatise obtainable to-day. It is a second edition of a work formerly published in two volumes, but so great has been the progress since the issue of the first edition that the present one may be regarded almost as a new work. The wide experience of the authors in this branch of surgery is well known and their book is based almost entirely upon their own experience. At the same time alternative theories and views of treatment are thoroughly discussed, and although some surgeons may disagree with certain of the methods of treatment advocated, it must be admitted that a very strong case is made out in support of these methods.

The text is easy to read, is carefully arranged, and suitably illustrated. Symptomatology is perhaps not sufficiently discussed, especially with regard to the surgical diseases of the stomach and duodenum. Since diagnosis is admitted to depend to such a large extent upon the past history, more help should be offered as to the value to be placed upon different points in the history. In fact, the changes in the appetite, the different types of vomiting, and the character of the hæmatemesis are not discussed at all under the general diagnostic considerations, but only under the individual headings. Full attention is given to the more modern methods of diagnosis, and scattered throughout the book are some beautiful reproductions of X ray photographs.

The description of the operative technique is very lucid, but the account of the choice of operation is less

clear, and the reader is left in doubt at times as to which operation the authors actually advise for the different types of lesion. There is, however, a very full discussion of many disputed points such as, for instance, the value of occluding the pylorus or of the performance of gastro-enterostomy with a perforated gastric ulcer.

The book is one which no modern surgeon can afford to be without, for here is gathered in convenient compass an epitome of work collected from innumerable original sources.

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DICTIONARY OF BRITISH SCIENTIFIC INSTRUMENTS.

Issued by the British Optical Instrument Manufacturers' Association. London: Constable and Co., Ltd. 1921. Pp. 335. 21*s*.

IT is not altogether easy to understand for what class of reader this work has been prepared. In substance it appears to be a catalogue issued by the Associated British Manufacturers of Optical Goods. Yet it is more than that. Certain chapters, devoted to the British optical industry, to navigating instruments, the Royal Meteorological Society, to British optical glass, and the Royal Observatory challenge a larger and more general interest than attaches to a mere trade catalogue, however extended and precise. But these more literary elements of the work are of very uneven quality. The chapter on the Royal Observatory is a compendious but very informing and interesting résumé of the work of that remarkable institution. The chapter on British optical glass again is well informed and readable. But the paper on the Royal Meteorological Society is drawn up like an annual report, and the short paper on navigating instruments is inadequate from every point of view. The most important part of the volume is the glossary—called a dictionary—of British scientific instruments; but a "dictionary" of scientific instruments of British manufacture which makes no mention whatever of the bistoury, scalpel, trephine, trocar, catheter, lithotrite, and dozens of other surgical instruments, seems to be misnamed. The fact that the publication is issued by a manufacturers' association would explain and even excuse the omission if the instruments specified were only optical. But seeing that the list does include specula, forceps, a cephalometer, and a milk jar, called by the curious name of "cremometer," it seems necessary to go farther than to the obvious principle of provenance to explain its limitations. Considered as a dictionary the work suffers from excessive compression. More useful and more intelligible than the too brief descriptions are the 150 pages of excellent engraved and photographed drawings of instruments manufactured or sold by the members of the Association. If the compilers of the book had shown literary faculty commensurate with the skill and taste with which the collection of diagrams has been prepared the work would have left us in no doubt as to its value from the readers' point of view.

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## JOURNALS.

*Quarterly Journal of Medicine.* Vol. XIV., No. 56, July, 1921.—Edgar F. Cyriax, in an article entitled Unilateral Alterations in Blood Pressure: the Differential Blood Pressure Sign, continues his observations upon the differences in blood pressure on the two sides of the body. This discrepancy, which he found to exist in a large number of cases of war injuries, he calls the "differential blood pressure sign." In the present series both medical and surgical cases were examined, and they were divided into two groups: (*a*) unilateral conditions, bilaterally unequal conditions, and operations performed upon structures in the middle line; (*b*) bilaterally equal conditions, and constitutional disorders. In the former group the differential blood-pressure sign was found in a large proportion of cases; in the latter group the sign was only present in about half as many cases. In all instances of spinal curvature investigated the sign was present.—J. C. Spence describes a series of Observations on Sugar Tolerance, with Special Reference to Variations Found at Different Ages. The blood-sugar curve is now generally recognised to be the most accurate method of determining sugar tolerance. He showed that the sugar tolerance is greater in infancy, but after the age of three a curve similar to those of young adults was obtained. Five apparently healthy men over the age of 60 were examined, and the sugar tolerance was found to be considerably diminished. In the four cases of cancer investigated, no definite change, apart from that attributable to age, was established.—J. W. McLeod, A. G. Ritchie, and C. A. Dottridge contribute an article on the Incidence of Infections with Pfeiffer's Bacillus Before, During, and After the 1918 Epidemic. According to the literature, Pfeiffer infections were rare in the early years of this century, but occurred in localised epidemics from 1915 onwards until the pandemic in 1918. Accepting the probability that Pfeiffer's bacillus is the causative organism of influenza, the authors have endeavoured to strengthen the view that there is a gradual diminution of infections with the bacillus in the years immediately following an epidemic, and a rise in the years preceding the next outbreak. They examined naso-pharyngeal swabs in 24 chronic venereal cases in the early summer of 1918, in 33 per cent. of which Pfeiffer's bacillus was isolated whereas in March, 1920, 47 similar cases were investigated and Pfeiffer's bacillus was found in only 8 per cent.—Thomas Lewis, in an article entitled "The Law of Cardiac Muscle, with Special Reference to Conduction in the Mammalian Heart," enunciates the Law of Cardiac Muscle as follows: "The fundamental properties of muscle will be found to vary in their degree in the four types of cardiac fibre; if for any two types we can obtain a measure, then within reasonable limits we may predict the degree for the remaining two types by placing all four in their natural order." The four types of cardiac fibre are (1) Purkinje substance; (2) auricle; (3) ventricle; and (4) a.-v. node. The Purkinje fibres are the largest, and contain most glycogen, the nodal fibres are the smallest, but on the other hand are the most rhythmic, and so probably the Purkinje fibres will prove to be the least rhythmic. The 2 : 1 response (half response) of cardiac muscle is described, in which the cardiac muscle only responds to every other stimulus providing they are supplied sufficiently frequently. The critical rate is greatest for auricle, less for nodal tissue, and intermediate for ventricle. The various conditions modifying conductivity are discussed, and emphasis is laid on the fact that the several properties of cardiac muscle have not been proved to be independent. In altered conductivity the cardiac function is probably depressed as a whole, but the four types of cardiac fibre are affected to different degrees according to the law of cardiac muscle.—Leonard Findlay, D. Noël Paton, and J. S. Sharpe: Studies in the Metabolism of Rickets. The authors commence their contribution by stating that the ætiology of the disease is no better understood now than when Glisson described it. Experiments were made to determine the calcium content of food, fæces, brain, and blood in rachitic and non-rachitic pups. The brain and muscles and the blood calcium content of the rachitic pups showed no divergence from the controls. The conclusion is therefore drawn that the calcium deficiency of the bones in rickets is not due to a deficient supply of calcium to the bones. The remainder of the paper is devoted to a study of the calcium balance in normal and in rachitic children. In normal children the excretion of calcium varies with age. During the first year of life, 35 per cent. of the calcium intake, which is high owing to the nature of the diet, is retained, and although the intake falls with the changes in diet as age advances, yet the utilisation percentage rises up to the time of puberty. The percentage utilisation in human milk is higher than in cow's milk, a fact that has not been explained. On comparing healthy with rachitic children no definite divergences were found. The utilisation of calcium in health and in rickets is fairly proportional to the intake, although in rickets slight discrepancies

do occur, and in cases of some duration the retention may be above the normal for that age, probably indicating that recovery is taking place.—D. Murray Lyon writes on Blood Viscosity and Blood Pressure. The viscosity estimations were made with Determann's viscosimeter. The author shows that in healthy individuals the viscosity of the blood rises to a maximum during the third decade of life, and then gradually falls, the curve following very closely that of the red blood corpuscle count, but not corresponding with the blood-pressure curve. In disease there is no close parallelism between blood viscosity and blood pressure. Martinet divided cases into three groups: (1) "Les eusystoliques," in whom the blood pressure corresponds with the blood viscosity. (2) "Les hypersystoliques," where the blood pressure is high, but the viscosity is low. (3) "Les hyposystoliques," where the blood pressure is low but the viscosity is high. Murray Lyon found that in anæmias and in cyanosis there is the closest correspondence between the blood pressure and blood viscosity, but in other conditions, owing to the compensatory power that the body possesses, the blood pressure is not markedly influenced by the blood viscosity.

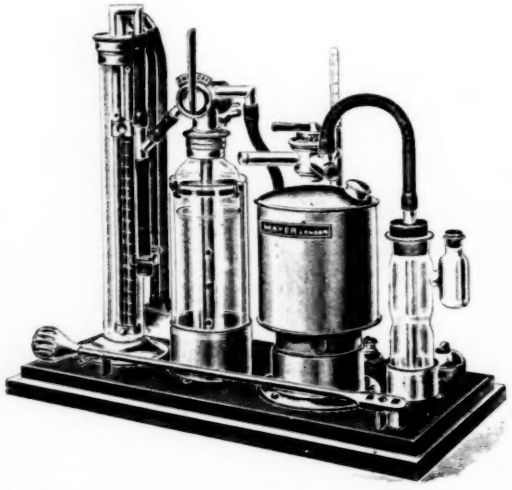
*The Biochemical Journal.* Vol. XV., No. 2, 1921. Cambridge University Press. 20*s.*—A Comparative Investigation of the Corresponding Proteins of Cow and Ox Serum, Cow's Colostrum and Cow's Milk by the Method of Protein Racemisation, by H. E. Woodman. Armed with this new method with which to attack the baffling problem of the chemical architecture of the protein molecule, Woodman finds that lactalbumin is identical with the albumin of colostrum, but that it is a substance distinct from serum-albumin. From this it is concluded that a distinct mammary synthesis is necessary for lactalbumin as well as for caseinogen. The euglobulin and pseudo-globulin fractions from serum and from colostrum are all shown to consist of the same individual protein, which is further identical with the serum-globulin. Incidentally, it is shown that the corresponding proteins of cow serum are identical with those of ox serum—the difference in sex of the animal not being accompanied by a difference in the constitution of its proteins—and that heat coagulation and variations in the mode of preparation are without effect on the rate of racemisation of globulin.—On the Theory of the Barcroft Differential Blood-gas Apparatus, by T. R. Parsons. It is shown by direct experiment that the constant of the Barcroft apparatus is the same when it is used to measure an absorption as when it is used to measure an evolution of gas. Mathematical calculation shows that a difference of constant would be expected in the two cases, but also that this difference is so small as to be well within the limit of the experimental error involved in the ordinary use of the apparatus. This result justifies the assumptions made during the determination of the percentage saturation of blood with oxygen by Barcroft's method.—On the Physiology of the Silk-worm, by A. P. Jameson and W. R. G. Atkins. The contents of the gut of the silkworm are shown to be markedly alkaline, the pH value being as high as 9·0–9·4. The chief digestive enzyme in this animal is an amylase, which differs from most starch-splitting enzymes in that it can act in a strongly alkaline medium.—The Influence of Reaction on Colour Changes in Tryptophan Solutions, by E. C. V. Mattick and R. S. Williams. The growth of *B. proteus vulgaris* in tryptophan solutions acidified with hydrochloric acid or made alkaline with caustic soda was studied. In solutions whose pH values were below 8·95 no growth took place; over the range from this value to a pH of 9·41 growth occurred and was accompanied by the formation of orange or yellow-coloured bodies; in a still more alkaline solution growth also took place but no coloration was observed, until finally, at a pH of about 9·6, the organism was found to be incapable of surviving.—Methods of Measuring the Opacity of Liquids; The Relation between the Number and Size of Red Corpuscles and the Opacity of their Suspensions; The Relation between the Microscopic Appearance of Precipitated Calcium Oxalate and the Opacity of its Suspensions; The Opacity of Serum Diluted with Distilled Water, Physiologically Normal Saline, and Ringer's Solution, by J. Holker.—On the Composition of the Unsaponifiable Matter of the Ether Extract of Human Fæces, by J. A. Gardner. By dint of elaborate fractionation of the non-saponifiable matter of human fæces a new sterol has been isolated, of which the constitution has not yet been determined. It is certainly not oxycholesterol.—The Antiscorbutic and Antiberi-beri Properties of Certain Sun-dried Vegetables, by J. A. Shorten and C. B. Ray. The vegetables are steamed or scalded for a few minutes before the sun-drying. This process retains the antiscorbutic vitamin of the coarser vegetables such as potatoes, tomatoes and cabbage, but destroys that of the more delicate products such as carrots, brinjal, spinach, turnips, and turnip-tops. Factory-dried mixed vegetables are also found to be devoid of anti-scorbutic properties. The sun-dried carrots, brinjal, spinach, cabbage, tomatoes and potatoes were found to prevent the appearance of neuritis in fowls on a polished rice diet.—On an Autoxidisable Constituent of the Cell, by F. G. Hopkins. In this paper Prof. Hopkins describes the isolation of the autoxidisable dipeptide of glutamic acid and cystein, "glutathione," which is responsible for the nitroprusside reaction in tissues.—The Influence of the Nervous System on the Excretion of Creatinine; Experiments on Nervous and Mental Patients, by A. A. Weinberg. It is found that the excretion of creatinine in nervous and mental patients is not entirely determined by the degree of muscle tonus, as a high excretion is observed in patients in whom the tonus is diminished. The amount of creatinine excretion seems to depend on the functional connexion between the cerebrum and the muscles, and becomes excessive when this connexion is interrupted.—The Salt Effect in Alcoholic Fermentation, by A. Harden and F. R. Henley. Salts in general are found to depress the rate of attainment of the maximum rate of fermentation of glucose and fructose by zymins. This is due not to an inhibition of the carboxylase enzyme which attacks pyruvic acid, but to a diminution of the rate of action of the hexose phosphatase.—Observations on Abnormal Iodine Values, with special reference to the Sterols and Resins, by I. Smedley MacLean and E. M. Thomas. This is a study of the iodine numbers of a wide range of substances as determined by the use of Wijs's reagent (iodine monochloride in glacial acetic acid) and Hübl's solution (mercuric chloride and iodine in 95 per cent. spirit).—The Effect of Exposure to Low Temperatures on Some Physiological, Chemical and Physical Properties of Amphibian Muscle, by D. L. Foster and D. M. Moyle. The irritability to induction shocks of frogs' muscles stored in air or oxygen at 0° C. falls off at first rapidly, then more slowly, and finally, after the lapse of about a week, more rapidly again. On the other hand, in nitrogen a rapid fall of irritability was maintained throughout. This loss of irritability in the case of muscles kept in air or oxygen was not due to accumulation of lactic acid; it was not accompanied by rigor. But the muscle rendered non-irritable by storage at 0° C. was found to be capable of producing lactic acid (just as is a fresh muscle) when kept at room temperature, exposed to nitrogen or toluene vapour, sent into heat rigor or submitted to mechanical injury. The non-irritability of the muscle is not due to lack of power of producing lactic acid, but to some physiological changes occurring on long exposure to the ice-cold temperature. Experiments on the increase of weight of these muscles in various solutions show that a solution which would be isotonic with a normal muscle is hypertonic to the non-irritable; the physical change which has occurred is therefore either a change in permeability of the muscle membranes or a diminution in the number of osmotically active particles in the muscle substance. There seems to be some degree of recovery of the irritability after perfusion of saline solutions.

# New Inventions.

## A COMBINED APPARATUS FOR INHALATION OR INSUFFLATION ANÆSTHESIA.

THE apparatus is designed for administering nitrous oxide-oxygen-ether by inhalation or insufflation, and ether by insufflation; it comprises the following units mounted on a wooden base:—

1. *Gas and oxygen sight feed*, consisting of two tubes, their upper parts of metal, and their lower six inches of glass, contained in a glass cylinder with a screw top. The outer ends of the tubes are fixed into the screw top and connected with the nitrous oxide and oxygen supply; the tubes inside are immersed in water up to their glass-metal junctions. They are pierced in their upper (metal) parts; the holes are of equal size, but the tube for registering nitrous oxide volumes has four openings, and that for oxygen only one. The gases issue from these openings and mix in the upper part of the glass cylinder, exerting, at the same time, a downward pressure on the water inside the glass tubes, and producing a water-level varying with the pressure of nitrous oxide or oxygen delivered, and therefore



indicating the relative volumes of the gases passing through the feed. As there are four holes for nitrous oxide and one for oxygen, the volume of nitrous oxide passing into the apparatus is four times that of oxygen when the water-levels in the tubes coincide. A centimetre scale placed behind the tubes serves as an indicator, and enables one to recognise changes in the relative proportions of the gases passing to the patient. The mixed gases leave the sight-feed cylinder by an exit tube also fixed into the screw top. A water trap prevents a sudden rush of gas forcing water from the feed into the ether bottle.

2. *Ether bottle* provided with a two-way stopcock, by means of which the gases can either be passed straight to the heater or be deflected in any proportion through the ether. The tube dipping into the ether is pierced by six holes, bored on alternate sides at distances of half an inch. When the stopcock is first opened the gases pass out of the highest hole only and bubble through approximately half an inch of ether; on opening it wider they issue from two, three, or more holes, and each subsequent bubble passes through a greater depth of ether. In this way more or less ether vapour can be added to the gas mixture. The bottle is surrounded by water to prevent freezing, and has a mark half an inch above the highest hole, beyond which the ether level should not be carried. It is filled by a device resembling a reversed Junker bottle, which fits any ether manufacturer's bottle by means of a cork. One tube, which dips into the ether, is connected with a tap on the ether bottle of the apparatus, and the other, which just passes through the cork, carries a pair of hand bellows. On squeezing the bellows the air pressure is raised in the bottle and ether forced into the apparatus.

3. *Heater for warming the gases.*—The gases pass through a coil of wide-bore tube surrounded by a water jacket, which is kept hot by an ordinary electric bulb, preferably about 20 watt metallic filament. It is thus adaptable to any current or voltage, taking a lamp in ordinary use for lighting. A thermometer indicates the temperature of the gases as they leave the heater.

4. *Two-way tap.*—The gases leave the apparatus through a two-way tap, one limb of which carries a safety valve.

5. *Safety valve.*—Dr. Shipway has kindly given permission for his mercury safety valve to be fitted to the apparatus.

### *Methods of Use.*

1. When used for insufflation of ether vapour only, the air supply is connected directly to the ether bottle and the strength of ether regulated by the stopcock.

2. When used with gas-oxygen-ether, cylinders containing the gases are laid horizontally on the lower shelf of the anæsthetic table and firmly secured to it by a long strap. (The carrying strap of the apparatus box serves for this purpose.) The flow of gases is controlled by one long key which fits both cylinders. The cylinders are connected with the gas feed by means of nozzles and rubber tubes. (*a*) For inhalation of gas-oxygen-ether, a bag and face-piece are attached to the plain limb of the two-way exit tap. The proportions of the gases are adjusted and more or less ether vapour added to them as the case demands. (*b*) For endotracheal or endopharyngeal insufflation, the tube going to the patient is attached to the limb of the two-way tap carrying the safety valve, and the gas mixture regulated as above. Induction may thus be carried out by gas-oxygen-ether via bag and face-piece attached to the plain limb of the tap. The catheter is passed, connected up with the other limb, which is protected by the safety valve, and the course of the gases is deviated by simply turning over the tap. For endotracheal insufflation an average of 120 gallons of nitrous oxide and 5 cubic feet of oxygen is required per hour; but for endopharyngeal insufflation a larger quantity is usually needed.

The apparatus has been used by me in over 500 cases at the Queen's Hospital, Sidcup, and elsewhere: the advantages claimed for it are: (1) Its portability; it weighs 15 lb. with cover. (2) Good control and steadiness are obtained by the long key and the method of fixing the cylinders; reducing valves or a cylinder stand do not seem to be necessary. (3) The fact that it combines three pieces of apparatus in one. (4) It renders easy the application of gas and oxygen to intratracheal work. Many of the cases which require an intratracheal anæsthetic are also those in which the non-toxicity of gas and oxygen is most desirable—e.g., excision of the tongue. (5) The method of filling the ether bottle obviates the danger of fire from ether vapour with an exposed flame, and prevents waste of ether. The heater appears to be a definite aid to an easy induction and a good anæsthesia. Apart from the necessity of supplying a warmed vapour in intratracheal cases, heating nitrous oxide seems to render it more potent, so that less ether is needed; and heating ether vapour renders it less irritating.

I have to express my thanks for the great amount of work in making, altering, and remaking many experimental models of each unit of the apparatus carried out in the first instance by Mr. F. C. Carr, a dental mechanic at the Queen's Hospital, and later by Messrs. Mayer and Phelps, New Cavendish-street, London, W., who produced the final model.

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Anæsthetist, Queen's Hospital for Facial and Jaw Injuries, Sidcup; Honorary Anæsthetist, Seamen's Hospital, Greenwich.

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ROYAL COLLEGE OF SURGEONS IN IRELAND.—Sir William Taylor, past President of the College, was the guest at lunch of the Dublin Rotary Club on Sept. 12th. In the course of his address Sir William Taylor made some historical references to the Royal College of Surgeons in Ireland, the foundation-stone of which was laid in 1806. The two main objects of the College of Surgeons, he said, were, firstly, to improve medical and surgical education in Ireland, and, secondly, to provide a sufficient number of properly qualified surgeons for the British army and navy. The schools of anatomy and surgery which were established in connexion with the College made great progress and won wide celebrity. The College of Surgeons was a neutral establishment without regard to sect or politics. As an instance of its extensive work in this matter of education he said that one-fourth of those placed on the register in Ireland came from this College.

# THE LANCET.

*LONDON: SATURDAY, SEPTEMBER 24, 1921.*


## Health Insurance and the State.

WHATEVER may lie behind a rumour that the continuance of the Insurance Act is being reconsidered in high quarters, at all events the position is sufficiently serious for all parties concerned to review the situation and to think over calmly the advantages of a scheme of compulsory health insurance on a large scale and whether they do or do not counterbalance the drawbacks. During the last ten years many and varied cries of disapproval have arisen from friendly societies, from the medical profession, from the contributing employer, and from the contributing employed person; although the last-named, the corpus vile of the Act, has less ready means to hand of rendering himself vocal. No one who has closely studied the working of the Act from anywhere within its orbit during this decade will dispute the justice of some of these complaints. Dr. H. G. COWIE sets them out vividly in our correspondence columns for the London area. Obviously it would have been impossible to carry through the greatest constructive health measure of our generation without coming up against conflicting interests. It was, for instance, hardly to be expected that the smaller and struggling friendly societies would like to be snuffed out because they had not in 1911 established themselves on a satisfactory financial basis. With the experience of the club system before the eyes of medical men in industrial areas it was natural for a State insurance medical practice to seem nothing other than a larger and no less objectionable club practice in which the doctors were obliged, by economic pressure, to give services satisfactory neither to themselves nor to their patients.

The Act has not yet had anything like a fair ten years' run. Up to 1914 it was largely a question of determining by the familiar plan of trial and error the details of working, and when the beginnings of a satisfactory working basis had evolved the war came and paralysed further development. In spite of this the Act has worked so well for the friendly societies that they now have at disposal a surplus large enough to be coveted for a number of useful purposes, and the *National Insurance Gazette*, which is devoted chiefly to the interests of the National Insurance Act, admits that the Treasury contribution of two-ninths to supplement the contribution of employer and employed might be withdrawn without seriously imperilling the working of the insurance principle. In the medical profession opposition has dwindled to small proportions, not merely, as has been hinted, because medical benefit is good business for the doctor, but because, in a large and true sense, it is solving the problem of medical practice in densely populated areas. The practitioner no longer accepts, with what good grace he can, a modicum of poorer patients, making up his loss from the remainder of a large mixed practice; insurance practice in an industrial area is now such as to attract young men and women with high academic qualification and untamed ambition. This alone is sufficient to justify the practical working-out of the insurance principle.

For it must not be assumed that, if the State renounced its quota towards health insurance, the contributory principle would fall to the ground. Everything points to the friendly societies being prepared to continue to offer medical benefit, making their own terms direct with the medical profession. We have no reason to doubt the possibility of cordial relations between these two administering agents in an insurance scheme. On neutral Government ground they are learning with great advantage to work together, as may be seen in several large centres in which the chairman of the panel committee is also the chairman of the insurance committee. On the other hand, there is nothing unlikely in a large industrial undertaking organising its own medical service to the entire satisfaction of both parties. This may, indeed, come about naturally in the course of time as a further development of welfare work, for when some such suggestion arose in the mining industry of South Wales the health benefits were construed in a generous sense, to include dentistry, nursing, and hospital provision. For the moment the advantage of the insured person himself is surely best secured by the continuance of the Act. The benefit to which he is entitled has grown considerably during the ten years, and has only been set back by the war and its aftermath in the same way as the quality of food-supply and other necessaries. Those, therefore, if such there be, who would demand the withdrawal of the Government as the third party in a great health contract between employer and employed should consider whether the time has yet safely come when health insurance can be left to the clash of conflicting interests. The State itself has a big responsibility in the matter.

## The Cancer Parasite: Facts and Fancies.

IT is necessary nowadays to keep a sharp watch on the cancer parasite. In a paper [1] entitled "A Critical Study of an Organism Associated with a Transplantable Carcinoma of the White Mouse," Dr. J. W. NUZUM, of Chicago, claims to have isolated from a mouse carcinoma (the Crocker Fund carcinoma No. 11) under partial anaerobic conditions a minute filtrable Gram-positive non-motile micrococcus. The method was that employed by NOGUCHI for the cultivation of filtrable viruses. Pure cultures of the micro-organism are said to present uniform morphological and cultural characteristics, but on the same page on which this statement appears it is also said that "an intensive study of the morphology of this organism has shown that the micrococcus is extremely pleomorphic." Sometimes larger forms appear in cultures approximating the staphylococcus in size. Injections of pure cultures of the organism into the breast tissues of mice have frequently produced nodules which grow progressively for 10–30 days and then slowly regress in the majority of cases. Microscopically these nodules show "a mass of newly formed tissue cells rapidly dividing and supported by a newly formed stroma which becomes vascularised." In one mouse (No. 250) the injection of a pure culture produced within a week a rapidly growing tumour. The tumour was palpable after one week and after four weeks had reached the size of a walnut. On microscopic examination it showed "a typical alveolar carcinoma identical histologically with the original carcinoma." On transplantation it grew rapidly and gave 80 per cent. of successful inoculations.

The author is careful not to claim that he has discovered the cause of cancer. He thinks that "two

[1] Surgery, Gynecology, and Obstetrics, August, 1921.

agents are concerned in the ætiology of this mouse carcinoma: the first agent being the minute coccal bodies stimulating the cells to rapid division, and second, the cancer cell itself closely associated with the organism and transmitting from host to host in subsequent transplantations." It is well known that the transplantable carcinomata of mice and rats have characteristic individual features both morphologically and biologically, and retain their individuality through many years of transplantation. The one successful experiment of Dr. NUZUM out of 1200 mice proves too much. If the micrococcus cultivated from the Crocker Fund carcinoma No. 11 is capable of causing in a normal mouse the formation de novo not only of a carcinoma but of a carcinoma identical with the original carcinoma, we would have to conclude that each tumour strain has its specific parasite so that each spontaneous tumour must have its own specific parasite. The description of Dr. NUZUM's organism and the method used for its isolation reminds us of similar organisms which were isolated not many years ago and said to be the causative agents of a great many different diseases of a more undoubted infectious character than cancer, such as influenza, encephalitis lethargica, trench fever, and a number of others. They were found to be contaminations. The rapid growth of the tumour in mouse No. 250 and the high percentage of successes in the first transplantation are so different from the behaviour of a spontaneous tumour that a more obvious explanation suggests itself.

Information of a very different kind on the ætiology of cancer is furnished in a paper by F. D. BULLOCK and M. R. CURTIS read recently before the New York Pathological Society.[2] G. L. ROHDENBURG and BULLOCK had observed that, in rats, sarcoma of the liver is almost always associated with the *Cysticercus fasciolaris*—which is the larval stage of the *Tænia crassicollis* of the cat—and that the new growth arises in the walls of the cyst. In the recent communication BULLOCK and CURTIS record the results of an experiment in which a large number of rats were infected experimentally with the eggs of the tænia obtained from one cat. In October, 1919, 1165 young rats were thus experimentally infected by placing measured doses of an emulsion of the eggs in the pharynx. Of these rats, 600 animals all belonging to one strain, which proved to be particularly resistant to the infection, were subsequently eliminated. Of the remaining 565 animals 279 were alive on June 30th, 1920, when the first tumour was found. During the next six months 230 of these animals were killed or died from natural causes. Of these 55, or 29 per cent., had shown tumours by January, 1921. Forty-nine of the 279 are still under observation. The litters obtained from the original animals have been added to the experiment; there are about 2500 animals comprising four generations. Of the first generation 30 animals had by January, 1921, developed tumours. Since then until May tumours have developed in 125 additional rats, giving a total of 210 animals in which sarcomata have been produced experimentally. The tumours were morphologically sarcomata, composed of either spindle cells or polymorphous cells. They arose in the cyst wall and showed rapid growth with invasion of the surrounding tissue and extensive metastasis formation. They were transplantable through several generations and were then, of course, no longer associated with the cysticercus. The malignant nature of these tumours is therefore clearly established. The authors attribute the origin of these neoplasms to the chronic irritation of the cysticercus acting over a sufficiently long period on a susceptible cell—the connective tissue cell of the rat. This work, which was carried out in the laboratories of the Crocker Cancer Research Fund in New York, is of the same fundamental importance as the recent work of FIBIGER on spiroptera cancer and as the experimental production of cancer obtained by YAMAGIWA and ISHIKAWA in rabbits and by FIBIGER and by MURRAY and WOGLOM in mice subjected to painting with tar over a long period.

[2] Proceedings of the New York Pathological Society, N.S., vol. xx., Nos. 6–8, October–December, 1920.

## A Clean Milk-supply.

IT is a comment on the national neglect of agriculture that legal enactments concerned with the sale of milk are in the hands of doctors, while agriculture has but a secondary place in the promotion of these enactments and no effective share at all in their execution. This position has arisen, at least in part, from the facts that this country was the first to devise active measures in promoting public health and that it was the medical profession which first took up the serious study of bacteriology and thus discovered that milk might be a source of disease. It was a misfortune that no such studies were made at that time on behalf of the milk industry, for combined effort by agriculture and medicine might have effected early and great improvements in the milk-supply. As it was, the attempts made were almost entirely of a legislative character, carried out by a body not directly concerned with agriculture whose criticisms of dairy methods were apt to raise a smile from the farmer. Even now there are serious agriculturists to assert that better methods of milk production and distribution are problems for public health and not for agriculture. The grave financial losses incurred as a result of bad methods of handling and distributing milk were not realised in the industry itself and the appeal from outside for an improved supply fell upon deaf ears. Even in dairy schools clean milk production was not taught. Such was the position which faced the Research Institute in Dairying when it was founded at University College, Reading, in 1913.

In the early days the outlook was not very hopeful. The gross annual income of the Institute was £1500; laboratories had to be created in an old house and workers found. The staff had no dairy farm or dairy under their control. Inquiry, however, soon showed that unclean methods of milk production and distribution were a source of grave loss to the industry. Work upon these subjects was, therefore, begun and has been continuously carried out at the Institute for the past five years. In the light of the results already gained it is clear that the problem of its milk-supply must be worked out by each country according to its own needs, since the conditions at the farms, the times of storage, and consequently of the age of the milk when distributed, and the temperature conditions to be encountered, vary greatly in different climates. Methods of management cannot be translated en bloc from one country to another. A further need for the continuance of these studies lies in the fact that the longer the work is carried on the clearer it becomes that the creation of an improved milk-supply lies with the worker. Each person who handles milk must acquire, along with his practical knowledge, the kind of technical skill that is found in an operating theatre. At present there are few such technicians available in the milk industry, but the study of the effects of variations in technique upon the ultimate state of the milk is constantly

being carried forward at the Institute. By means of demonstrations, classes, and lectures, and the circulation of its publications, the results of that study are spread abroad, and every year a greater number of persons within the industry is acquiring the requisite skill.

This is no small work for a single Institute to have accomplished within eight years. The fact that its work is now being appreciated at its proper value by the milk industry is shown by the long list of inquiries received every year, by the increasing number of clean milk competitions promoted by county councils or by dairymen, and by the applications for help in preparing clean milk demonstrations at agricultural shows. Throughout its career the dairy teachers have given the Institute their cordial support and have incorporated much of its work in their daily teaching. They have remodelled the syllabus of dairy education in order that methods of clean production may form part of the student's course. The Ministry of Health has given financial support to the work of the Institute, admitting in so doing that the problem of clean milk is one to be solved by combination of effort between agriculture and public health. At Birmingham, at Salford, and we hope shortly at other towns, the medical officer of health, those engaged in the milk industry, and the agricultural education establishment in the district are working together to improve the supply of milk. When those who administer the milk regulations take a sympathetic interest in the difficulties of the milk industry, a long step will have been taken towards a solution of hygienic dairying.

## TUBERCLE AND RESTRICTED MIGRATION.

THE conditions [1] under which emigrants from the United Kingdom who have suffered from tuberculosis will be admitted into the Commonwealth of Australia are less interesting than the conditions under which they will be deported thence, at their own expense, should they have the ill-fortune to suffer relapse. The Commonwealth Government are willing, subject to certain conditions, to admit persons in whom the disease has been arrested, if they have received the education of a period in a sanatorium and have, in addition, been symptom-free for at least 12 months. The conditions of admission include certification by a medical man who is an expert in tuberculosis, preferably by a tuberculosis officer, for whose services the Commonwealth Government is willing to pay a fee of one guinea to the local authority. A satisfactory report having been furnished, the intending emigrant must then obtain the formal consent of the Commonwealth Minister for Home and Territories before admission. It is only to be expected that such persons shall be subject to the ordinary examination by the quarantine medical officer at the port of disembarkation, and it is not unreasonable that in the event of their disease having become active during the voyage they should not be allowed to land. But it is the last provision in the circular asking for the coöperation of local authorities in this scheme which may well dishearten those unfortunates with a past history of infection and present prospects in Australia. "They will be liable to report themselves for examination at the end of each 12 months during the first three years spent in Australia, and in the event of the disease having become active during that period they would be liable to deportation at their own expense." The acceptance of a citizen, after due precautions, might, we think, entail recognition of responsibility for a risk which has been taken with open eyes by a new country hungry for immigrants.

[1] Circular I.D.B., No. XII., 1921, issued by the Scottish Board of Health.

# Annotations.

"Ne quid nimis."

## CHILDREN'S ORTHOPÆDIC CENTRES.

DURING the past few years it has been necessary to organise physical treatment by massage, exercises, and electrical methods on a very large scale for the treatment of disabled soldiers. The first institution which became prominent in carrying out this sort of treatment was the Grand Palais Hospital in Paris. Visitors from this country to Paris criticised the work of this institution in that the physical treatment was too much divorced from surgical treatment; for example, stiffness following fractures and contractures from wounds were to be seen under treatment lasting over very considerable periods, whereas with better primary treatment they should never have been allowed to arise. In other cases, massage and electrical treatment were carried on for conditions which required preliminary surgical treatment or the use of splints or apparatus. In this country, although a good deal of physical treatment was carried out in convalescent or command depôts, the most important organisation in this line consisted in the formation of the many military orthopædic hospitals, in which physical treatment of all sorts was closely coördinated with surgical treatment. More recently a number of additional centres for the physical treatment of out-patient pensioners have been organised all over the country, some by the Ministry of Pensions itself, many by other organisations, particularly by the British Red Cross Society. The principle of coördination was kept by associating these centres, as far as possible, with the orthopædic hospitals, and by arranging that they were visited regularly by surgeons from these hospitals. Now at last the work of these centres in the treatment of pensioners is beginning to diminish, and some of them are turning their attention to the treatment of civilian cripples, particularly to crippled children. Here the problem is a very different one. Crippled children, in many cases, have suffered from tuberculous disease, in which the use of physical treatment, except under strict surgical supervision, is actually dangerous. A large proportion are suffering from infantile paralysis and spastic palsies, for the treatment of which massage and electrical methods, although often of use, are apt to be wasted unless closely coördinated with other varieties of orthopædic treatment. Centres for dealing with crippled children and adults should be of great service, particularly in districts which are not well served by hospitals, but, if they are to carry out their work to the best advantage, they must be brought within a complete scheme of orthopædic treatment and not exist as isolated bodies. The Central Committee for the Care of Cripples have had this matter under consideration and have drawn up an outline of principles (see p. 669) which should guide the establishment of orthopædic centres for children.

## COMPARATIVE MEDICINE.

THE wide field common to workers in medical and veterinary science, and the necessity of a closer coöperation between them, were the main subjects of discussion at the recent quarterly meeting of the Mid-West and South Wales Veterinary Medical Association at Bridgwater. The feeling has long been growing on both sides that work in almost watertight compartments is a source of weakness; in a paper on "Bacterial Food Poisons" Dr. W. G. Savage referred to numerous conditions which are still obscure "because they touched on the work of the two professions and were neglected by both."

In the discussion which followed the reading of Dr. Savage's paper, General Sir Layton Blenkinsop expressed the opinion that many of these cases would not arise if animals destined for human food had to be slaughtered under efficient medical supervision, and that a person who supplied the public with food of any sort became a public servant, who should conform to Government regulations, and should have no claim in that connexion to be considered a private individual. Prof. F. Hobday contrasted the state of affairs in this country, where, in his view, the value of collaboration had not been realised, with that obtaining on the Continent, where medical men and veterinary surgeons collaborate in the laboratory and in the field. He also contended that the absence of State aid, and pecuniary aid generally, had severely hampered younger members of the veterinary profession; and that the reason why there was not more disease in England was the general custom of cooking food well before eating it. Mr. W. M. Scott, President of the Association, disagreed with Dr. Savage's view that food for human consumption was more likely to be contaminated after death than during life, maintaining that many animals apparently in excellent health can really harbour organisms of various kinds. Sir Clifford Allbutt, who was unable to be present, referred, in a letter which was read to the meeting, to the successful meeting held at the Royal Society of Medicine in February, between that Society and the Central Branch of the National Veterinary Association,[1] and pointed out that fusion of medical and veterinary practice was impossible; veterinary surgery must retain its own examinations and qualifications. In Cambridge what they were aiming at was to found a school of research in animal and plant pathology, and to present preliminary sciences to the student in a way that would serve both professions.

## BRITISH DENTISTS' HOSPITAL.

THE ninth annual report of the British Dentists' Hospital, which has just been issued, contains statistics showing a rapid growth of the work carried on at the various centres and clinics of the Dentists' Hospital service. The rules of the hospital provide that fees are to be paid by patients; a scale is fixed on this basis, but the Executive Council reserve the right to vary this scale in exceptional cases. Payment by instalment is permitted; dentures must be paid for when supplied unless payment is guaranteed by some responsible person or society. All treatment is carried out by dentists holding the L.D.S. diploma, who are also members of the British Dental Association; anæsthetics are administered by medical men. Thus a standard of skilled dental care similar to that of private practice is secured and maintained. Each treatment centre is under the charge of a resident matron. The intended establishment of centres throughout London was rendered impracticable by the war, and the report speaks of general apathy on the part of the majority of dentists in the matter of a qualified dental service for the masses. The provision of dental clinics for maternity and tuberculosis patients has rapidly extended during the year. At the Camden Town, Lewisham, and Clapham Common centres the hospital has working agreements with the St. Pancras, Lewisham, and Wandsworth Borough Councils respectively, enabling mothers attending local welfare centres to obtain dental treatment and the provision of artificial teeth. The Battersea, Fulham, Hampstead, Holborn, and Southwark Councils have also arranged with the British Dentists' Hospital for the institution of dental clinics for the same class of patients at the council centres; the equipment and the services of dentists are provided by the hospital executive. At Greenwich, Hampstead, Holborn, Paddington, and Wandsworth, under agreements with the hospital, patients attending the local tuberculosis dispensaries obtain advice and necessary treatment on the recommendation of the medical officer of health. Most of these clinics have been opened during the year. The earlier experiments at Greenwich and elsewhere were carefully watched by medical officers of health of other London boroughs, and by the authorities at the Ministry of Health, and sanctions for the establishment of similar clinics resulted from a conviction of the real value of the work made possible by them. By a recent agreement the number of L.C.C. school children to be attended to annually at the treatment centre at Rushey Green has been increased to 2200. The executive has also agreed to provide dental treatment and advice for the 500 male members of the Oxford and Bermondsey Insurance Society at a clinic to be established in the neighbourhood of Tower Bridge-road and Grange-road, Bermondsey. Dental propaganda work has not been overlooked; literature has been regularly distributed to the patients, and a number of lectures have been given during the year. The year's record is of an organisation that deserves encouragement and support.

[1] THE LANCET, 1921, i., pp. 711 and 726.

## CHOLERA PROPHYLAXIS.

AN efficient cholera quarantine depends naturally upon a sufficient and pure water-supply, but more especially under modern conditions upon rapid and efficient laboratory methods of detecting carriers of the cholera vibrio. It is well known that these carriers may be in apparent rude health, but as in the case of enteric and other intestinal disorders of bacterial origin they may, and probably are, under favourable circumstances the starting-point of an epidemic. An organisation capable of examining thousands of pilgrims for the cholera vibrio has to be based upon the most efficient methods for isolation of this organism. Special selective media, such as the alkaline agar of Crendiropoulo, have been generally adopted, but the plating out of each individual stool and the search for the cholera vibrio on the incubated plates is a lengthy and tedious procedure. The recognition of the cholera vibrio has been greatly facilitated by the employment of specific anticholera sera of high titre, which are capable of clumping the organism in such manner as to be visible to the naked eye, even in high dilutions. Such a method was introduced by Otto,[1] who by enrichment media and plating out on Dieudonné's medium, and employing the agglutination test for the recognition of the colonies, was able to make a positive diagnosis in 48 hours. By employing numerous labour-saving devices he estimated that in order to examine 10,000 stools daily it is necessary to employ a staff of 35 persons (of whom three should be specially trained doctors with bacteriological experience, and six trained laboratory assistants). It has been found by Bandi,[2] that with the addition of a minute amount of cholera-immune serum to the primary culture tubes of peptone water, a most distinct visible agglutination of the vibrio takes place, so that the tedium of the process of recognition can be still further reduced.

An improvement upon this method, utilised by Arthur Davies in an epidemic in Palestine, was described by him in the *Journal of the Royal Army Medical Corps* for October, 1920. By mixing the suspected peptone water culture with cholera serum on a glass slab—known as Garrow's agglutinometer—on which macroscopic agglutination rapidly takes place, it was found that the presence of vibrios in the primary culture could be more accurately detected than by any visual method. A provisional report upon a suspected stool could thus be submitted within 18 hours of the receipt of the specimen. Moreover, the procedure, as worked out, was found to be so simple that a trained worker was capable of examining no less than 200 suspected stools during a day's work of eight hours.

[1] Otto: Centrbl. f. Bakt., 1915, lxxvi., No. 5, 392–400.
[2] Bandi: In Kolle and Wassermann, 1910, vol. iv., p. 6, Handb. b. path. Mikroorganism.

It is probable that modern cholera prophylaxis will be based more and more upon rapid and labour-saving laboratory methods, such as the one described above, since efficient laboratory organisation is the mainspring of cholera control. In this respect the Egyptian Public Health Department is fortunate, for it can command the services of several officers specially trained in cholera work. This department has had a considerable experience in cholera detection and control, for both before and during the war its vigilance has been unrelenting, and it is mainly due to the organisation of the Central Laboratory in Cairo, under the direction of Dr. Charles Todd, that the introduction of cholera from Palestine during the period of hostilities was prevented and that so many minor epidemics in Egyptian villages were nipped in the bud. The absorption of the International Quarantine Board into the Egyptian Public Health Department is now considered probable. The Board, which has been for many years responsible for the control of Egyptian ports, and especially for the health conditions of the annual pilgrimage to Mecca, has been called upon to concert measures with the French authorities in Syria and the Palestine Government against the possible spread of cholera from Russia. The present Mecca pilgrimage having been declared free from infection, westward bound pilgrims will henceforward have to submit only to the normal period of quarantine at Tor in Sinai. It is presumed that cholera control stations will in future be established at Beirut in French Syria and at Kantara at the terminus of the Palestine railway, based upon the system elaborated at Tor.

## AORTIC REGURGITATION FOLLOWING LETHARGIC ENCEPHALITIS.

THE mischief that may follow in the wake of lethargic encephalitis is proving to be extraordinarily varied, and the disease, which a few years ago was regarded as one with an almost exclusive affinity for the nervous system, is now known to be no respecter of other systems, such as the cardio-vascular. Dr. D. Paterson and Dr. J. C. Spence recorded in our columns [1] recently a series of 25 cases in children, treated at Great Ormond-street Hospital, in the majority of whom permanent after-results were left; only one-fourth made a complete recovery. In a recent note on the late sequels of lethargic encephalitis, Dr. H. F. Höst [2] has recorded the case of a workman, aged 18, who had previously been well. On Dec. 7th he developed intermittent diplopia. Examination by an oculist next day proved negative, but a couple of days later he felt unwell and chilly, and his left arm became painful. On Dec. 11th, when first seen by Dr. Höst, he complained of violent pain in the left side of the neck, and the left shoulder and wrist. The temperature was 38·5°C., but there were no paralyses, no swelling of any joint, and no sign of heart disease. Two days later there was a complete change in the clinical picture; the pain had vanished and he became very drowsy, sleeping all day and having to be awakened for meals. The temperature of about 38° C., in conjunction with the other symptoms, left little doubt as to the diagnosis of lethargic encephalitis, and he was sent to hospital. He was discharged on Jan. 7th, comparatively well, but still suffering from lassitude. Two days later Dr. Höst examined him and was surprised to find definite signs of aortic regurgitation. Over the second right intercostal space and the adjoining portion of the sternum there was a prolonged, soft, diastolic murmur, which began with the second heart sound and continued throughout almost the whole of diastole. There was no other sign of aortic regurgitation, such as a capillary pulse, with this exception: the diastolic blood pressure was 55 mm. There was no evidence of mitral disease. In young adults aortic regurgitation without mitral disease is generally regarded as the result of syphilis. But in this case there was no history of syphilitic infection, and no clinical sign of it. As the regurgitation had developed within a few weeks, during which the patient had suffered from a febrile condition undoubtedly due to lethargic encephalitis, the correlation of the two was very probable. This case is the more remarkable as it is usual, indeed practically the rule, for the mitral valve to be first attacked when an acute disease, such as pneumonia, angina faucium, acute rheumatism, and the like, gives rise to endocarditis.

[1] THE LANCET, Sept. 3rd, p. 491.
[2] Tidsskrift for den Norske Laegeforening, July 15th, 1921.

## TUBERCULOSIS AND PROSTITUTION.

IN a recent address before the Berlin Medical Society Dr. J. W. Samson [1] discusses the subject of tuberculosis and prostitution from observations which he commenced in 1914 on 1300 women under the control of the Berlin police. With the exception of Spillmann of Nancy, who at the International Congress of Tuberculosis in 1905 described tuberculosis as a venereal disease, secondary only in importance to syphilis and gonorrhœa, no previous writer appears to have dealt with the relations between tuberculosis and prostitution. Dr. Samson attributes this omission to two principal causes: in the first place to the mistaken belief that coitus with a tuberculous woman is of too transitory a character to enable infection to take place; and secondly, to the equally erroneous supposition that women suffering from tuberculosis would be unable to pursue their profession or attract any clients. As regards the first supposition recent observations with the tuberculin reaction have repeatedly shown that only a brief contact in the case of young persons is sufficient to produce tuberculous infection; and it should be remembered that the great majority of the prostitute's clientèle is composed of youthful persons. The supposition that tuberculous women would be unable to pursue their occupation only holds good in the last stages of the disease. Moreover, the great majority of the women are compelled to continue their unhappy calling because the progress of the tuberculous process unfits them for any arduous work. Dr. Samson found that although about 10 per cent. of the 1300 women studied had more or less active tuberculosis, only one-seventeenth of those in the first stage, one-fifth of those in the second stage, and one-third of those in the third stage, according to the Turban-Gerhardt classification, were in a poor state of nutrition and so likely to repel their clients. The main contingent of those affected with tuberculosis were women between the ages of 20 and 30, a time of life when the disease is most frequent in other occupations, and, what is of special importance from the epidemiological standpoint, when they are most likely to be attractive to the male sex. Dr. Samson remarks that it is difficult to understand why attention has not previously been given to the high incidence of tuberculosis among prostitutes in view of the large number of factors which favour its prevalence in this class of women, especially bad hygiene, inferior housing accommodation, alcoholism, and sexual excess. On the other hand, the prostitute has two distinct advantages over other women—namely, a lesser expenditure of energy owing to the absence of any regular or heavy employment, and a remarkably high income compared with that of other occupations, the average earnings of professional prostitutes aged from 25 to 40 in Berlin in 1919 being four to five times as high as those of women occupied in other ways. It is noteworthy that syphilis, which was present in at least two-thirds of the 1300 cases, had, with a few exceptions, no appreciable influence on the course of the tuberculosis and that the two infections ran their course independently. As regards the effect upon tuberculosis of alcoholism, which from time immemorial has been associated with prostitution, Dr. Samson found that though there

[1] Berliner klinische Wochenschrift, Sept. 5th, 1921.

were actually fewer cases of tuberculosis among the women addicted to drink, advanced cases were somewhat more frequent among heavy drinkers. For further information on the subject of tuberculosis and prostitution, which possesses clinical, epidemiological and social interest, Dr. Samson refers the reader to his recently published monograph.[2]

## SMOKE.

THEORIES about the causation of fog, arguments based on the reduction of the washing bill, diatribes as to the folly of allowing unburned fuel to go up the chimney, records showing the loss of sunlight in industrial towns, the damage done to the masonry of buildings, private and public—all these have hitherto failed to produce a public opinion sufficient to energise a really active campaign against the smoke nuisance. It is just possible that the practical recent demonstration of how much the joy of life in a town is increased by a clear atmosphere may succeed where these other arguments have failed. The beauty of London during the recent spring and summer months will not be readily forgotten. The discussion on smoke abatement at the Edinburgh meeting appears to have taken a practical turn. As a rule speakers are inclined to argue that domestic fires being the chief cause of the trouble it is hardly worth while bothering about factory chimneys. But at Edinburgh members of the British Association pointed out that although two-thirds of the London smoke may be due to domestic chimneys, the case is different in many manufacturing towns. Smoke from factory chimneys can be dealt with, even though we have no legal power to deal with domestic fire smoke, and the nuisance could be largely abolished except in the case of a few metallurgical furnaces. The difficulties in the way of bringing effective pressure to bear are notorious, but not insurmountable; the will, however, to act on our present powers seems strangely lacking. One has only to read regularly the annual reports of medical officers of health in order to appreciate the fact that the prevention of smoke is a veritable Cinderella among the interests of health committees. Local authorities whose duty it is to carry out the law are seemingly obsessed by a superstitious reverence for a smoky chimney as the necessary concomitant of good trade. Owners of smoky chimneys are generally fairly well represented on the local authorities. Moreover, the chimneys of the local authority, such as those of the public baths, isolation hospital, or electric power-station, are sometimes the worst offenders.

## A SCHOOL OF RADIOGRAPHY.

THE first school of radiography to be established in the United Kingdom is to be opened at King's College Hospital, London, next month under the direction of Dr. R. Knox, hon. radiologist to the hospital. It is intended for the training of technical assistants in X ray and electrical departments, and the classes will be under the supervision of Dr. Knox and the assistant radiologist, Dr. H. A. Colwell, while the teachers also include Mr. C. P. G. Wakeley, F.R.C.S., and Mr. A. O. Forder, M.S.R. The course of instruction comprises general elementary physics: sound, heat, and light, ideas of measurement, energy, mass, and so forth to be incorporated as the subject progresses. Electricity, from a knowledge of electrical terms, electrical attraction and repulsion, cells and batteries, the theory of ionisation, sinusoidal currents, condenser discharge apparatus, static machines, functions of electrical measuring instruments, leading on to the construction of apparatus, and how to manage Coolidge tubes and controls, accumulators and transformers, with practical deductions for localisation of foreign bodies, methods of dosage, application of diathermy, high frequency, ultra-violet rays, and radium. Anatomy, as far as the development and elementary morphology of human skeleton, surface markings and positions of the chief viscera. Photography, covering photographic chemistry, lantern slide making, printing, enlarging, copying, and clinical photography. The school is open to both men and women over 18 years of age, the course of instruction lasting a year and being preparatory to the examination of the Radiographers' Society. This examination has been established with a view to securing adequate training upon scientific lines for skilled non-medical workers in X ray and similar departments. The enormous developments of radiology—both from a therapeutic and from a diagnostic point of view—have made a thorough grounding, in theory as well as in practice, essential; and it is realised that a few months spent in an X ray department with little or no systematic training are quite insufficient to produce an efficient and skilled worker. The possession of the diploma of "Member of the Society of Radiographers" (M.S.R.) will therefore be evidence, not only that the holder has passed an examination, but that he or she has had systematic practical and theoretical training in the subject for at least a year. The number of students in each course is limited, the fee for the full course being 35 guineas. Inquiries should be addressed to the Radiographer, King's College Hospital, Denmark Hill, London, S.E. 5.

## INDIRECT DETERMINATION OF FUNCTION.

EXPERIMENTAL physiology is liable to the reproach that deductions may be made from results obtained under unnatural conditions, and that laboratory findings are not always upheld by practical experience. An example of this is afforded by the antidiuretic effect of pituitary extract in man, despite the highly diuretic properties originally attributed to it as the result of physiological experiment. It is well recognised that psychical and irrelevant factors play an important part in modifying the functions of bodily organs. The pulse-rate is frequently increased as the result of the excitement induced by a medical examination, and the blood pressure may be raised by the novelty of the processes used in estimating it. Any indirect method of observation which eliminates this psychical factor is likely to give a more accurate picture than if the patient is aware that direct observations are being made. An example of this is afforded by the electrocardiograph, by the use of which a graphic representation of the heart's action can be obtained while the patient lies quietly in bed, and no attention is paid to the heart.

In a recent issue we published an article by Dr. E. C. Dodds in which this method of investigation is carried a stage further. The reaction of the secretions of the stomach and duodenum is determined by means of a series of examinations upon the alveolar air. The psychical factor can thereby be eliminated, as the patient is completely unaware that his gastro-intestinal functions are the subject of research. Direct methods of determining the reaction of the gastric secretions are liable to errors, as the result of the emotional influence of the experiment, the unappetising nature of the test meal, and the possible mechanical effect of the swallowed tube upon the gastric glands. Drs. T. Izod Bennett and J. F. Venables using the fractional method of gastric analysis have demonstrated the emotional inhibition on gastric secretion, by making suggestions of nausea and anxiety to normal subjects under hypnosis, and although, as Pavlov originally showed, mechanical stimulation alone of the gastric mucous membrane will not cause secretion, yet the passage of the stomach tube through the œsophagus in some cases leads to a copious flow of saliva, which necessarily lowers the acidity of the stomach contents. Dr. Dodds, when testing a Haldane gas analysis

[2] Prostitution und Tuberkulose. Klinische und Social-Medizinische Untersuchungen. Leipzig: Georg Thieme.

apparatus for estimation of $CO_2$, found that analyses made at different times of the day showed a range of 8 mm. Hg tension of alveolar $CO_2$, and that these variations were not due to experimental error, but were directly related to the ingestion of food. Haldane had showed that respiration is so regulated as to maintain the alveolar $CO_2$ tension approximately constant, that the stimulus to the respiratory centre is the H-ion concentration of the blood, and that any factor raising the acidity of the blood will automatically increase pulmonary ventilation and so lower the $CO_2$ in the alveolar air and blood plasma. The effects of alteration in the reaction of the plasma, as in violent exercise or in diabetic coma, upon the alveolar $CO_2$ tension are well known, but that the pouring out of acid from the blood during gastric digestion and of alkali during pancreatic secretion should influence the reaction of the blood and so the alveolar $CO_2$, although a rational deduction, had not been experimentally verified.

We await with interest further evidence upon the reaction of the blood and urine in the series of cases investigated by Dr. Dodds, and would congratulate him upon a successful application of the deductive method of reasoning to an important physiological and pathological investigation, the results of which correspond so closely with those obtained by the fractional method of gastric analysis.

## POST-SCARLATINAL MIDDLE-EAR DISEASE.

WHEN commenting[1] on the Annual Report of the Metropolitan Asylums Board we expressed regret that the final portion of Mr. T. B. Layton's report, consisting of "suggestions put forward for organising a service to prevent the occurrence of chronic ear disease as a sequela of the infective diseases," and containing recommendations now under consideration, had not been published. A large part of this valuable report on the otological work done at the North-Eastern and Western Fever Hospitals is directed to just this point, the prevention of chronic ear disease as a result of the infectious fevers, or rather of scarlet fever, for the few cases of ear discharge in the other fevers were not enough to justify any conclusions. Mr. Layton finds that there is a great divergence of opinion as to the proportion of cases that leave the fever hospitals with chronic inflammation of the middle ear; otologists appear to believe that they are very numerous, whilst the medical officers of fever hospitals consider that they are relatively few. Possibly both are right; the percentage is low, but the total is nevertheless large, owing to the immense number of cases of infectious fever passing annually through the Board's hospitals. Similarly, aural surgeons in general believe that the middle-ear suppuration occurring in scarlet fever is more severe than other forms, whereas epidemiologists hold the opposite view. Mr. Layton supports the latter from his experience of 12 months' work, and offers two principal explanations: that scarlet fever varies in its clinical type, so that severer complications *may* occur in other epidemics; and that the otologist does not often deal with the mastoiditis occurring during scarlet fever, but rather with the secondary infections which occur in ears previously damaged by the disease. We can hardly agree with his third explanation—namely, that the otologist stirs up the inflammation by surgical interference. Mr. Layton finds, and most otologists will confirm this, that early paracentesis of the inflamed drum is the best way to limit the number of cases of chronic otorrhœa. The problem is how to ensure that this is done as soon as it is required. Aural surgeons have advocated daily routine inspection of the drum in fever patients; Mr. Layton finds it takes about an hour to do 30 cases, which is at the rate of one minute for each drum, and that it would therefore take one man an eight-hour day to go through a hospital of 240 beds, even if one man could do such routine work. Neither does he think it practical that each medical officer should examine the ears of all his cases daily, as there is a constantly changing personnel, and he has obtained much better results by asking the officers and ward sisters to look out for the symptoms of early ear disease, especially pain and a sudden rise of temperature, and to report to the otologist. Mr. Layton performs the paracentesis without a general anæsthetic, chiefly to avoid the loss of time consequent on waiting for consent, and does not mention the use of any local anæsthesia. The treatment, once the ear has begun to discharge, contains nothing noteworthy, and it has been decided not to proceed to the removal of tonsils and adenoids during the children's stay in the fever hospitals; under these circumstances it is to be hoped that arrangements are made for the performance of this operation after their departure. For mastoiditis Mr. Layton performs a Wilde's incision, and considers this operation particularly useful in severe cases of scarlet fever; it appears that he only proceeds to antrotomy if the temperature remains raised or if the incision fails to heal. We look forward with interest to the publication of recommendations based on his experience.

[1] THE LANCET, Sept. 10th, p. 580.

## THE WAR-BLINDED IN GERMANY.

Sir Arnold Lawson, in a recent issue of THE LANCET, related the scheme of re-education for the blinded sailor and soldier in operation at St. Dunstan's. There are about 4000 Kriegsblinde in Germany, 287 of them being natives of Silesia, and in a little brochure[1] which has reached us Dr. Kurt Uhthoff tells how, in the province of Silesia, the problem of the war-blinded has been faced. At first the help given was largely through voluntary agencies of which there were a large number. Now the war-blinded are under the care of a branch of the official administration. The pension in the case of a single man with no previous skilled employment amounts to about 4550 marks a year; not too much, it would seem, when the depreciation of the mark is taken into account. An essential part of the system is that each of the blinded men has a caretaker (Fürsorger) who reports on his needs to the local committee and makes it his special business to advise and help as to his training for employment. The result has been so far successful that at present only about one-third of the war-blind are without some sort of remunerative employment. These include, besides the usual employments of brush, mat, and basket making, typewriting, telephone operating, massage, and various other employments. Country settlements have been attempted but here the inevitable difficulties of housing soon became apparent. German experience agrees to a great extent with that at St. Dunstan's. Poultry-farming is one of the employments, but experience shows that this is hardly suitable for a single man. The writer agrees with Sir Arthur Pearson that those with a minute amount of vision are far more difficult to help than the totally blind. The latter goes so far as to say that a slight residue of vision is a positive disadvantage to man from the point of view of learning a trade. On the whole the problem seems to have been approached in Germany in much the same spirit as it has been at St. Dunstan's, but we suspect that the latter has the advantage in providing the communal life during the period of re-education. A special feature of the German scheme is the proposal to supply each blinded man with a trained dog to guide him on his walks, embodied in a law made last year. The training of the dogs—German sheep dogs and Airedale terriers are mentioned—is carried on at a Government institute and already some 2000 canine attendants are available.

[1] Über das Schicksal der Kriegsblinden und ihre Versorgung mit besonderer Berücksichtigung der Kriegsblinden Schlesiens, by Dr. med. Kurt Uhthoff. Halle. Pp. 103. 9.50 M.

## EXPERIMENTAL RICKETS.

THE causation of rickets, either experimental in animals or that form so frequently manifested in the human child, is far from settled. The study of experimental rickets continues to attract many observers in the United States, and in the Proceedings of the Society for Experimental Biology and Medicine (Vol. XVIII., 1921) there are a number of communications of considerable interest. A. F. Hess, G. F. McCann, and A. M. Pappenheimer describe experiments on rats to show that the view held by other observers that the development or non-development of rickets is dependent mainly on the absence or presence of the fat-soluble vitamin A or a vitamin closely associated with it—a vitamin sometimes called anti-rachitic—does not hold true either for experimental or human rickets. In young rats fed from three to four months or longer on a special diet markedly deficient in this vitamin there was no instance where rachitic lesions, either microscopic or macroscopic, were noted. That the dietary contained only a minimum of the fat-soluble vitamin was proved by the lack of gain in weight after the animals had been fed on the food mixture for about 60 days, by their prompt response in growth on the addition of 6 per cent. of butter fat to the diet, and by the development of ophthalmia or keratomalacia in almost all of the animals and its rapid subsidence on adding butter to the dietary. In addition to eye lesions the rats on a restricted diet developed many infections. Those receiving 0·5 c.cm. of orange juice did not, however, develop either ophthalmia or infections as frequently as others in which the diet did not include this food. Control animals which received the same diet with, however, an addition of butter did not develop ophthalmia, grew normally, and remained in perfect health. It was concluded that a lack of the fat-soluble vitamin in a dietary which is otherwise complete does not lead to the development of rachitic lesions in rats.

The same observers, with the addition of T. F. Zucker, experimented on the effects of various modifications of a diet known to produce rickets in rats; such a diet is one composed of patent flour, calcium lactate, sodium chloride, and ferric chloride. If, however, 0·4 per cent. basic potassium phosphate was substituted for an equal percentage of calcium lactate in this diet, the animals were uniformly protected against the development of rickets. The question arises as to whether it is to the potassium or the phosphate that the protective action of the basic potassium phosphate is due. By substituting sodium phosphate in one series of experiments, and potassium chloride in another, it was shown that the protection is conferred by the phosphate and not by the potassium. E. V. McCollum and some of his pupils in their studies on experimental rickets describe observations which demonstrate in a striking way the differences in the effectiveness of cod-liver oil as contrasted with butter fat in influencing the rate and extent of growth and their effects on the histological structure of bone. A restricted diet containing 3 per cent. of cod-liver oil, but deficient in calcium, induced fairly good growth and fertility during at least eight to ten months. The same food mixture with butter fat to the extent of 3, 10, or 20 per cent. of the food mixture fails to induce an appreciable amount of growth. The rats usually die within a few months. The same diet with 10 per cent. of casein added, but without the addition of either fat or cod-liver oil, causes pathological changes characteristic of rickets. With small amounts of cod-liver oil (3 per cent.) no rachitic changes are seen in the bones. Even 20 per cent. of butter fat fails to effectively direct the growth processes in the bones toward the normal condition. This food mixture, containing 3 per cent. of butter fat and 1·5 per cent. of calcium carbonate, is a highly satisfactory diet for the promotion of growth to the full adult size, the maintenance of high fertility throughout the breeding period of the females, and the successful lactation by the mothers. Without the calcium addition, but with 3 per cent. of butter fat, very little growth can take place. The striking differences between the nutritive properties of cod-liver oil, as contrasted with butter fat, only occur with diets in which the phosphorus content is approximately the optimum, and with the calcium content distinctly below the optimum.

The same observers experimented with a diet faulty in only two respects, and, when fed to the young rat, in a comparatively short time (three to five weeks) produced rickets. The diet was extremely poor in fat-soluble A, the anti-xerophthalmic substance, and young rats developed this condition in four to five weeks. The gross tokens of rickets in the rats were very marked and the microscopic evidence of rickets in the skeleton was convincing; the condition in the bone produced by the faulty diet was at all points identical with that seen in advanced rachitis of human beings. When butter fat (0·5 per cent.) was added to the faulty diet, xerophthalmia was postponed, but the pathological condition of the skeleton remained essentially unmodified; a 10 per cent. addition of butter fat effectually prevented xerophthalmia, life was prolonged, but rickets remained. If 2 per cent. of cod-liver oil was added no pathological condition of any sort—not even rachitic—developed in the skeleton. The authors conclude that butter fat is feeble in its anti-rachitic properties, and this fact seems to be of great practical importance in so far as the explanation of the occurrence of rickets in the human being is concerned. Cod-liver oil, on the contrary, is powerful in its anti-rachitic properties.

## A SAFE WATER-SUPPLY.

THE rain which has fallen in the South of England during the past fortnight has been welcome enough to gardeners and allotment holders but has done little to replenish the starved water-supplies. Such a gush of water as there was in London on the night of Sept. 11th brings its own perils, for, as our Special Correspondent recently pointed out (THE LANCET, August 13th, p. 353), when the fear of scarcity has disappeared, questions of purity will immediately arise. What kind of water is going to be impounded, in unprecedented amount, into heavily depleted reservoirs, and will all wells yield, in due course, exactly the same quality of water as in the past? Six weeks ago it did not appear that the health of the community had suffered as a result of prolonged drought, but, in the week ending Sept. 3rd, 191 deaths from diarrhœa and enteritis in children under 2 years were reported in London, and the number of deaths from this cause during the month of August has had no precedent since 1914 (see Summary of Vital Statistics, p. 674). On the other hand, the mortality from the enteric fevers was below the yearly average. In the circular on Water Supplies just issued to local authorities the Minister of Health reminds them that, while there is no immediate cause for anxiety, the prolonged drought increases the risk of water-borne disease occurring. The prevalence abroad of cholera calls for special vigilance and the occurrence of any outbreak of diarrhœa, however mild, should lead to a critical examination of the water-supply. Attention is directed to chlorination as the best method of securing rapid and efficient sterilisation, and the process is described in useful detail in an appendix to the circular letter which we reprint on p. 671. Ex-service men may protest that chlorinated water in France did not taste agreeably, but it is not an essential part of the process to add more chlorine than is needed to oxidise the organic impurities.

THE Harveian oration will be delivered at the Royal College of Physicians of London at 4 P.M. on Tuesday, Oct. 18th, by Dr. Herbert Spencer.

Surgeon-Commander A. C. W. Newport, R.N., will accompany the Prince of Wales to India as personal medical officer.

## CHILDREN'S ORTHOPÆDIC CENTRES.

IN view of the fact that some of the clinics established for the treatment of pensioners are now desirous of extending their work and including the treatment of crippled children, the Central Committee for the Care of Cripples have had under consideration the work of such clinics for the treatment of children by massage, remedial exercises, and electrical methods[1] and have drawn up the following report.

The types of children for whom such treatment may be suggested are:—

1. *Rickets.*—It is very doubtful whether physio-therapy is worth while. Minor cases are best treated at infant welfare centres by regulation of feeding and medicine and attention to hygiene. Major cases require either splinting or operation, or treatment in a residential institution where the hygiene and the diet are carefully supervised. Out-patient massage is waste of effort; it is impossible to give skilled massage to an infant.

2. *Infantile Paralysis.*—The treatment may be divided into (1) Prevention and correction of deformities: (*a*) splinting; (*b*) operative treatment; (*c*) use of walking apparatus. (2) Physio-therapy: (*a*) massage; (*b*) re-education of movement; (*c*) electrical treatment. These should be considered as a whole. In an early case splinting, massage, and electrical treatment of the appropriate muscles should be provided, followed at a slightly later stage by re-education of movement and by the provision of any necessary appliance. The scheme of treatment must be settled by a surgeon with special experience in this work, who should direct which muscles are to receive treatment and which movements require re-education. There is a tendency to consider physio-therapy as the panacea for infantile paralysis. This is not so. It has its uses, but must be applied thoughtfully as a part of the whole scheme of treatment. Only selected muscles and movements should be treated and exercised. It is easy by giving electrical treatment to the stronger muscles to produce rather than to diminish deformities. After two years from the date of onset of the paralysis physio-therapy has only very restricted uses. During the later stages, however, carefully thought out exercises to improve the power and control of muscles which have recovered but are not in active use, and to undo bad habits, may produce great improvement. It requires great experience and intelligence to draw up the scheme for such treatment. These cases more than any others should be under an orthopædic surgeon whilst under treatment. Treatment should in no case be indefinitely prolonged.

3. *Spastic Paralysis.*—These repay physio-therapy only in so far as they are capable of improvement by re-education. Massage and electrical treatment are useless. It may be said generally that the appropriate methods of re-education are not taught in the massage schools, so that a masseuse will not be able to deal adequately with a case of spastic paralysis unless she has preliminary and special instruction.

In all except very mild cases the treatment by re-education is only a part of the treatment, preliminaries being the reduction of the spasm by surgical methods such as tenotomy, division of nerves, division of posterior nerve-roots, and perhaps the provision of walking appliances. Many cases of spastic paralysis are so mentally deficient that they are unable to respond to any form of treatment.

4. *Scoliosis and Round Shoulders*, divisible into: (1) Mild postural cases. The essential element in these is not bone deformity or muscular weakness, but lack of proper muscular control and balance. Their cure is a question of physical education. They are best dealt with in small classes and by educational gymnastics. Such treatment is most easily given in the schools. Apparatus is not essential; if apparatus is provided it should be only of the simplest, the most valuable pieces being (*a*) reversible bench for balance work, and (*b*) a few rib stools. Plinths are not wanted. (2) Mild structural cases. It is essential that these should be under regular surgical supervision, as they are the type of case from which the bad scoliosis arises, and often arises very suddenly. Exercises for these require most careful regulation. The best exercises are, as a rule, those for improvement of control of muscle balance—i.e., educational. Splints for recumbency and supports for the spine may be required. (3) Severe structural cases. These require much the same treatment as the last class, but in many cases there is a tendency to treat by exercises children with fixed severe curves which are quite incapable of improvement. The number of bad cases of scoliosis among school children is relatively very small.

5. *Flat Feet.*—Flat fleet and talipes valgus are common in children. The first essential in treatment is to see that proper boots or shoes are worn. Boots that have been modified or are supported by a steel spring may be required. Subject to this, exercises are useful in a large proportion of cases. Class exercises in school are all that are required, except in a few special cases. No apparatus is required unless it is a skipping rope.

6. *Breathing Exercises* can be best done in classes in school. No apparatus is required.

7. *Bone and Joint Disease.*—It should be our aim to see that these cases are treated, as far as possible, in residential institutions while at the active stage. During later stages they require careful after-care, namely: (*a*) periodical surgical supervision to watch progress; (*b*) supervision to see that apparatus is worn and rules as to rest carried out.

The types of cases which require orthopædic supervision and treatment can therefore be divided into: (*a*) Those for whom class exercises only are required. These should be dealt with by special physical education classes in schools, and should not be brought to treatment centres apart from initial and periodic examinations. The treatment of these children in clinics interferes much with their schooling, and is unnecessarily expensive. (*b*) Those who require orthopædic treatment. This may include surgical supervision, splinting, surgical appliances and physio-therapy such as massage, exercises, and electrical treatment. These cases cannot be dealt with at a clinic at a school, but should be treated either in a hospital out-patient department, or if one is not accessible, in a centre which is virtually an outpost of the orthopædic hospital, and should be supervised by a surgeon trained in orthopædic work and in touch with the central hospital, which can deal with portions of the treatment which cannot be carried out at the centre.

Such centres should be: (1) Established only where a hospital cannot adequately carry on the work of the area. (2) Part of a complete scheme of orthopædic treatment for the area and properly coördinated with a hospital. (3) Under the surgical supervision of an orthopædic surgeon, who visits sufficiently often to exercise adequate supervision. He must be paid. (4) Coördinated with: School medical work—school medical officer should visit the clinic weekly and admit new cases; infant welfare centres; school classes for corrective exercises; Invalid Children's Aid Association.

The Central Committee for the Care of Cripples are willing to assist in the first organisation of a clinic or system of clinics, and particularly to assist in the selection of visiting orthopædic surgeons.

[1] A report drawn up by the Central Committee for the Care of Cripples on the Organisation of Clinics for the Treatment of Children, 20, Berkeley-street, London, W. 1.

PÆDIATRIC RESEARCH FELLOWSHIP.—The John and Temple Research Fellowship has been established for a period of three years at St. Thomas's Hospital by Mrs. Temple Thomson. The Fellow elected receives £600 per annum and is required to act as chief clinical assistant in the Children's Department at St. Thomas's Hospital, as well as to undertake research work in some clinical or pathological subject especially connected with children. It is a full-time appointment.

# BRITISH ASSOCIATION AT EDINBURGH.

## SECTION OF PHYSIOLOGY.

(*Continued from p. 624.*)

A JOINT discussion with the Section of Chemistry was held on

*Oxidations and Oxidative Mechanisms in Living Tissues.*

The discussion was opened by Prof. F. GOWLAND HOPKINS, F.R.S., who dealt with the chemical aspect of the biochemical oxidation of fatty acids, sugars, and amino-acids, and gave an outline of the current views concerning the mechanism by which these oxidations are effected. Prof. HOPKINS had recently isolated from tissues a dipeptide, one of the components of which was cystine, a sulphur containing amino-acid. The cystine portion of the dipeptide could also be converted to the cysteine or reduced form, and could thus act as a hydrogen acceptor. By so doing it enabled a peculiar form of oxidation to occur; water was decomposed, the hydrogen being taken up by the sulphur dipeptide, while the oxygen was available for oxidations. These changes were effected by the activity of a special enzyme which resembled the Schardinger enzyme present in fresh milk. If a mixture of milk, formaldehyde, and methylene-blue were warmed the formaldehyde was oxidised to formic acid, while the methylene-blue was reduced to the colourless hydrogen addition product. These simultaneous oxidations and reductions probably play a very important part in effecting tissue oxidations.

In the discussion which followed Dr. C. LOVATT EVANS, referring to the great significance of the isolation by Prof. HOPKINS of the formerly obscure sulphur derivative present in the tissues, commented on the fact that hydrocyanic acid, employed as a poison gas in the war, exerted all its physiological effects by depressing the oxygen usage of the tissues, and, significantly enough, was eliminated as sulphocyanide. It seemed extremely likely that its conversion into sulphocyanide in some way deflected the proper functions of the sulphur dipeptide. The neutral sulphur of the urine, which was also affected by cyanide administration, seemed to be a further indication in the same direction.

Prof. R. ROBINSON, F.R.S., and Prof. G. BARGER, F.R.S., gave chemical analogies to oxidations occurring in the tissues. Prof. A. V. HILL, F.R.S., gave a short account of the relations of lactic acid to muscular contraction and heat production in presence and absence of oxygen.

The section paid a visit to the clinical laboratory of the Royal Infirmary, directed by Prof. J. Meakins. Demonstrations of the effect of resistance to, and of restricted volume of, breathing by the methods devised by Dr. J. S. Haldane and his collaborators were shown. An apparatus for the study of the psycho-galvanic reflex was also shown.

Prof. E. P. CATHCART, F.R.S., opened a discussion on

*The Physiology of Heavy Muscular Work.*

The problems concerned, he said, were of a complex nature, since not merely the muscular, but also the circulatory, respiratory, and nervous systems were involved in an intricate coördination. Psychic factors were of especial importance in the onset or masking of fatigue; collapse from overstrain as a consequence of muscular exertion was most commonly of cardiac origin. Work might be divided into three physiological types, positive and negative, as in raising and lowering a weight, and static, as in maintaining a weight. The latter was of considerable importance, and played a very large part in all very severe work. It was particularly potent in arousing subjective sensations of fatigue, and yet was associated with no greater metabolic breakdown than positive or negative work; probably a restriction of the circulation through the muscles was one of the reasons why static work is accompanied by such severe subjective effects.

Prof. HILL, referring to the contraction and recovery processes in muscle, said that it was essential in prolonged effort for the recovery process to keep pace with the breakdown processes accompanying contraction; under these circumstances the muscles were, so to speak, living on their income, whereas in brief but violent efforts they were living chiefly on their capital. He was convinced of the importance of static work because the duration of single muscle twitches was so short. The stiffness following heavy static work was also a marked feature. One reason why a short contraction was less efficient than a more prolonged one was that relatively more energy was required to alter the shape of the viscous muscle tissues quickly than to change it more slowly, just as greater energy was needed to stir treacle quickly than to stir it slowly. He also described an apparatus for the study of maximal work in human muscle.

Prof. H. BRIGGS described a method previously detailed in the *Journal of Physiology*, by which he had studied the degree of physical fitness of recruits. The method was also applicable to the detection of malingerers.

Dr. J. S. HALDANE, F.R.S., gave a short communication dealing with the circulatory changes during exercise. In connexion with this part of the subject Prof. HILL resumed the discussion, and described how, by measurement of the velocity of the pulse-wave by the use of the hot-wire sphygmograph, some measure of the circulation rate could be obtained from the formula:—

$$\text{Velocity of pulse wave (in M. p. sec.)} = 3{\cdot}57 \Big/ \sqrt{\%\ \text{increase of volume of arteries per mm. Hg pressure.}}$$

It is interesting to note that the pulse wave travels with an increased velocity during exercise, especially in older persons; in young individuals whose arteries are more elastic the change in velocity is smaller.

Prof. A. D. WALLER, F.R.S., then described his well-known investigations on

*The Physiological Cost of Muscular Work*

as determined by measurement of the carbon dioxide output, and claimed that his simple technique gave results of greater accuracy than the other and more elaborate methods dependent on measurement of the oxygen intake. This statement was subjected to extremely severe criticism by Prof. CATHCART, and was also criticised by Prof. A. KROGH and Dr. HALDANE. An interesting fact was brought out by Prof. Krogh—namely, that fatigue occurred more easily in subjects whose diet was largely composed of fat than in those whose diet contained large amounts of carbohydrate. With reference to the restriction of circulation in static work he had, contrary to expectation, been unable to obtain definite proof of this, though it was certain that static effort was less fatiguing if interrupted at short intervals.

Mr. E. FARMER, M.A., contributed an interesting paper at the close of the discussion dealing with the

*Economy of Human Effort in Industry.*

There were innumerable difficulties in the investigation of industrial fatigue, not the least of which was the difficulty of obtaining any true measure of fatigue. Constant coöperation and intercourse between the laboratory worker and the field or workshop investigator were necessary in all such investigations.

At a later meeting, papers on colour-vision were read by Dr. F. W. EDRIDGE-GREEN and Dr. J. H. SHAXBY. Dr. Edridge-Green showed that the effect of adding white light to any spectral colour was virtually the same as an addition of yellow. The reason was apparently because yellow is the most luminous component of white light. Dr. Shaxby described a method of testing colour discrimination.

# CHLORINATION OF POTABLE WATER:

## CIRCULAR OF THE MINISTRY OF HEALTH.

THE rapid and efficient sterilisation of drinking water by means of treatment with chlorine is described in an appendix to Circular 241, issued by the Ministry of Health on Sept. 15th to local authorities.

*General Principles of Chlorination.*

Chlorine is most readily available in the form of chloride of lime (bleaching powder) which can readily be obtained commercially. This, if freshly made, should contain 33 per cent. of free or active chlorine. It loses its efficacy on keeping, especially during hot weather; but this loss may be retarded by the addition of 25 per cent. of quicklime. Samples of the bleaching powder used should be examined by a chemist to see that the proper amount of chlorine is present. Any deficiency in strength may be counteracted by an increased dose.

In order to be sure that all infective organisms are killed, the chloride of lime must be added to the water in such quantity that free chlorine will be available to the extent of at least one part per million of water. This will be effected by the preparation of a solution of chloride of lime consisting of 1 ounce of chloride of lime to 1 quart of water. This will suffice to treat 2000 gallons of a water which does not contain an excessive amount of mineral or organic matter.

If the water is very impure, discoloured, or contains much suspended matter, it should, if circumstances permit, first be clarified by the addition of from 2 to 8 grains per gallon of alum and an equal proportion of powdered whiting, and allowed to stand in a tank, from which it should be decanted to another tank for the addition of the chloride of lime solution.

*Removal of the Taste of Chlorine.*

After the addition of the chloride of lime, the water should, *if practicable*, be allowed to stand in an open tank for four hours before consumption. If this can be effected there will usually be no complaint of taste of chlorine in the water. If this cannot be effected the taste may often be removed by the addition of a small quantity of permanganate, sufficient to produce a very faint pink colour fading away in about 5 to 15 minutes; or, so far as the chlorine taste is concerned, by the addition of a solution of sodium thiosulphate (the hyposulphite of soda used in photography) in small quantities. The quantities of these preparations which are necessary to remove the taste can be quickly determined by practical tests. Wherever possible, in the case of a water-supply which is filtered, the chlorine solution should be added after filtration.

*Adaptation of Method to Quantity.*

There are various ways of adding the chlorine solution to the water. If it is a small supply, such as that from a cottage well, dip well, small spring, or land drain, the water will have to be pumped into some receptacle such as a tub, barrel, or tank cart, and the chlorine solution added by hand. Water should be allowed to stand for four hours in the open and then be distributed to consumers.

If it is a larger supply, corresponding methods, involving the adding of measured quantities of the chlorine solution by hand, will probably have to be adopted in the first instance, because it takes time to provide or arrange apparatus.

If the treatment has to be continued for any length of time, however, an improvement on this method is to provide a small tank to hold the chlorine solution, which is fed from a larger tank, and kept filled to a certain level by means of a ball tap or other similar contrivance. In this way, a constant level, and, therefore, constant pressure, is maintained in the small tank, which assists in regulating the flow. If this is fitted with a fine glass tube, having a controlling tap and a pressure gauge, the solution may be allowed to drip at such a rate as to pass the required amount per hour into the water, the rate of discharge of which into the reservoir is known. The tap should be so arranged as to drip over the point of discharge of the water into the reservoir. When the reservoir is filled, the chlorinated water should be allowed to stand for four hours before consumption, if practicable.

When the chlorine cannot be added to the water in the reservoir the solution may be injected into the rising or other main by means of a suitable contrivance, such as a pump driven by a turbine from the rising main, the amount of solution injected being proportionate to the rapidity of flow of water in the main, a definite relation being established between the two.

The tank containing the chlorine solution should preferably be of glass, in order that any failure in the supply may be detected at a glance.

*Difficulties and Safeguards.*

The continued use of chloride of lime, except where employed on a very large scale, and under skilled supervision, may give rise to difficulties in that it requires labour and constant attention, and it will probably be found that some other method of adding the chlorine will in the long run be preferable if the treatment has to be continued for an indefinite period. Various liquid preparations containing chlorine in known proportion may be employed, such as "Chloros," which contains from 10 to 15 per cent. of available or free chlorine and is prepared by the United Alkali Company, Liverpool. The liquefied gas can also be employed, and there are various forms of apparatus for effecting this automatically, also for using the dry chlorine gas or a solution of this in water.

Any mains, pipes, cisterns, or tanks which have contained polluted water should be emptied and disinfected. It will frequently be found, after the water mains, pipes, and cisterns have been disinfected by a strong solution, say, five parts per million, and after the use of chlorine, in the proportion of one part per million, for some days in the water, that the amount of chlorine may be reduced to one part in three millions, and risk of "taste" will then be reduced. Whether this can be done will depend on the course which the outbreak of disease takes, and on the results of analysis, bacteriological and chemical, of the water before and after treatment with the chlorine.

The appendix concludes by stating that in the case of a heavily polluted water it is well to make sure that some free chlorine is present after the addition of the solution to the water. This can be ascertained by the starch and iodide of potassium test, which is particularly sensitive if the water is at a low temperature; the materials for this test can be obtained in the form of compressed tablets. The use of poisonous metals in any apparatus dealing with the water whilst under treatment with chlorine must be avoided.

# VIENNA.

(FROM OUR OWN CORRESPONDENT.)

*Attempts to Restrict the Number of Matriculations.*

VARIOUS proposals have been made of late years with a view to checking the constant increase in the number of medical students in Vienna. The dissecting rooms and laboratories were more than crowded before the war, and latterly things have become worse. The formation of the new States in Middle and Eastern Europe, the increase of illness caused by the war, and the changed mentality of many millions of people, have necessitated a larger and better supply of qualified doctors; and nearly all the new medical students have flocked to Vienna, the old centre of learning, where are the best equipped institutes and the best teaching available for them. As a consequence the Viennese and other Austrian students began to be crowded out; moreover, the majority of the foreign students from Eastern Europe are Jews, who have been more or less expelled from Poland, Roumania, or Russia, and possibly religious bias has assisted the decision of the dean of the medical faculty to admit no more than 400 new first-year students to matriculation for this term, with the proviso that only if all Austrian applicants have been accommodated may the remainder ask for admission. This proviso does not, however, apply to students who have already had one term at the university, or to post-graduates; such students are encouraged to continue their studies. This restrictive measure is also justified by the small number of human bodies available for dissection and the very high prices demanded for animals—even frogs, mice, rats, and rabbits—used for experiments. Naturally its promulgation has not received unanimous support, as it is feared that the high standard of liberty hitherto enjoyed by the Vienna school may be discredited by its application.

*Influx of Foreign Physicians.*

Quite a number of foreign doctors have recently taken medical courses in Vienna and are now busily engaged in scientific and practical work in the clinics

and laboratories. Amongst them Italians and Americans are most numerous; the latter have reconstituted the "American Medical Association of Vienna," which in pre-war times occupied an important position in the university. It is intended to re-establish the English courses formerly controlled and organised by that association. Numerous medical men from the Scandinavian countries and Holland have also come to the city, where they find not only a courteous reception and excellent opportunities for study, but a rate of exchange greatly to their advantage—enabling them, indeed, to save money during a sojourn in this country. At present special post-graduate courses are proceeding in the clinics of oto-rhino-laryngology, ophthalmology, and skin diseases, and in the laboratories of the pathological and chemical institutes; all other institutes and clinics will shortly be completely ready for post-graduate classes.

*Indirect Extension of the General Hospital.*

The present financial situation of the State, which is not likely to improve for some time, makes it impossible to proceed with the old plan to erect the remaining clinics of the general hospital on their selected site. The old military hospital, however, is not now required for its original purpose; under the Empire Vienna, being the military centre of a large army, boasted an enormous garrison hospital, now practically unused. This old building can thus be converted at comparatively little cost, in order to accommodate a large number of institutes and offices of the general hospital. Thus the kitchen, the administrative offices, the disinfection plant, the laundry, and the nurses' home will be transferred to the garrison hospital, and the premises thus rendered vacant in the general hospital devoted to creation and enlargement of clinics. A number of wards containing patients not required for teaching purposes, and convalescents, will also be transferred; the neurological clinic already possesses a dependance in the garrison hospital, and the departments of dermatology and pathological histology are now in process of migrating. The change will be completed within a year. The clinical beds alone will then number over 2000, and scientific work will not, as hitherto, be hindered by lack of space.

*Difficulties of the University in Innsbruck.*

The medical faculty of the University of Innsbruck (capital of the part of Tirol left to Austria) is faced with a serious dilemma which threatens to stop its work completely. The hospital where the clinical patients are housed is supported partly by the provincial council, partly by the municipality, with only a small grant from the Government. These contributions have suddenly been discontinued, the municipality having denied its obligation to assist in the upkeep of a State institution. The provincial council followed this bad example, and the Government is unwilling or unable to carry the entire burden. Negotiations are now going on; a real deadlock would mean a severe blow to the medical life of this country. The medical organisation is, therefore, on the look out to intervene or to assist in a satisfactory settlement.

*Impending Retirement of Prof. Choostek.*

The intention of Prof. Choostek, the famous neurologist, to retire from clinical work, and the plan of the Government to discontinue his—i.e., the third—clinic for pathology and internal diseases, has caused uneasiness in medical circles. This excellent investigator and teacher commands great respect amongst his colleagues, and his decision has caused sincere regret. Attempts are being made to persuade Prof. Choostek to reconsider his decision; it is surmised that the Government has in some way offended the professor, and would like to use this opportunity to dispense with the cost of one of the clinics. It is hoped such a deplorable result will not be permitted to follow.

Sept. 6th.

# Public Health Services.

## COÖRDINATION OF PUBLIC MEDICAL SERVICE.

COÖRDINATION of the public medical services is a desirable thing to which we are very far from having attained. Uncertainty as to the future position of the guardians no doubt blocks the way, but that is no reason why the medical services at present directed by local authorities should not be unified. The Bradford Health Committee's proposals to unify all the medical work of the health and education committees by putting it under the control of one committee of the corporation should meet with approval. Many medical officers of health make similar recommendations. Thus Dr. E. W. Hope, of Liverpool, in his last report, in referring to this subject, says:—

"It is an administrative blunder to break the continuity of health supervision so soon as the child reaches its fifth birthday and impose the obligation for the child's health upon a different body, constituted for a wholly different purpose, and by no means always appreciative of the health needs of the child."

Dr. Charles Porter, in his 1920 report for Marylebone, deals with the matter as it affects the Metropolitan boroughs. He refers to the quite unnecessary duplication of work, to cross-purposes and excessive correspondence resulting from the existing system, and says:—

"In no part of the kingdom, indeed, is the divorce between the general public health work and school medical work so complete as in the Metropolis, and since it is impossible to see any justification for it on public health grounds, certainly, and probably also on economic grounds, it is difficult to see why either the central government authorities or the local authorities have for so long acquiesced in the arrangement."

Other anomalies in our existing system of health administration which lead to overlapping are to be found in the control of tuberculosis and the supervision of the midwifery service. Large urban districts charged with the administration of maternity and child welfare schemes do not control their own midwives, while it is now becoming more and more recognised that well-trained midwives may be invaluable helpers in such schemes. Antenatal work, the encouragement of breast-feeding, the prevention of ophthalmia neonatorum all suffer from the lack of unified control. Metropolitan boroughs are at the present time making a move towards better coördination of official and voluntary efforts with regard to tuberculosis and infant welfare.

## REPORTS OF MEDICAL OFFICERS OF HEALTH.

### A GROUP OF METROPOLITAN BOROUGHS.

*Kensington.*

THE estimated population of the Royal Borough of Kensington in 1920 was for birth-rate 165,496 and for death-rate 164,177. The birth-rate during 1920 was 24·3, the death-rate 13·4, the infant mortality rate 81, the death-rate from phthisis 0·82, and from other forms of tuberculosis 0·27. Dr. J. Fenton tells us that one of the most important steps during the year has been "the establishment of an advisory committee to the maternity and child-welfare committee to assist the council in coördinating the work of the numerous voluntary bodies engaged on child-welfare work in the borough." There are seven centres and the borough has been mapped into seven areas with a centre in each. Five of the centres provide dental treatment. There is an infant clinic in addition, which Dr. Fenton thinks might usefully act as a treatment centre for the seven child-welfare centres. Whatever the future of local government in London this coördination of child-welfare work seems eminently desirable. One of the seven day-nurseries has been closed, and on this subject Dr. Fenton says: "The future of day-nurseries requires careful consideration, for it is open to question whether it would not be better and even more economical to spend money on keeping necessitous widowed and deserted mothers

at home with their children rather than on the support of day-nurseries." The council subsidises the Kensington District Nursing Association to carry out, under the instructions of the medical attendant, the treatment of cases of ophthalmia neonatorum. Every one of the 53 notified cases of this disease has been finally reported as cured without any appreciable loss of vision. In one case, however, which was not notified, the sight of one eye was completely lost and that of the other seriously damaged. The council have now arranged to take over the North Kensington Tuberculosis Dispensary and run it as a municipal institution—another wise move. The treatment of tuberculosis in South Kensington is carried out for the council by the Brompton Hospital, and it is hoped to arrange a satisfactory system for the examination of contacts and suspects. Dr. Fenton points out that a tuberculosis dispensary ought not to be a place for doling out bottles of medicine and cod-liver oil and malt, as was the tendency during the war, but ought to be more and more confined to cases requiring expert treatment and diagnosis.

*Hampstead.*

The estimated population of the Metropolitan Borough of Hampstead for 1920 was 91,519. The birth-rate was 17·1, the death-rate 9·4, the infant mortality rate 47·9, the death-rate from phthisis 0·45, and from all forms of tuberculosis 0·60. The infant mortality rate is very satisfactory even in a district which Dr. F. E. Screse tells us "is almost entirely residential, the greater portion being composed of well-to-do people, with two districts situated on the east and west composed almost entirely of the working classes."

Like Kensington, the Hampstead Borough Council have been engaged in drawing up a coördination scheme which will utilise the efforts of all the voluntary bodies engaged in child-welfare work, including the Hampstead Council of Social Welfare. Dr. Mary Kidd, who is in charge of the pre-maternity clinics, reports that as the result of the agreement with the District Nursing Association, the nurses send up cases and the pre-natal work is growing rapidly. The dental clinic for nursing and expectant mothers is doing good work. Dr. Kidd thinks the allowance of milk to expectant and nursing mothers has enabled a larger proportion to feed their babies up to nine months and in this way has helped in the lowering of the infant mortality rate. Nine cases of ophthalmia neonatorum were notified. Eight cases made a complete recovery; particulars of the ninth are not given. The report contains an elevation of the first block of the South End Green housing scheme, the only one of many proposed which has fructified. The first block was expected to be ready for occupation in May, 1921. The scheme consists of 140 flats, 20 with one bedroom, 78 with two bedrooms, and 42 with three bedrooms.

*Poplar.*

The Borough of Poplar comprises the registration sub-districts of Poplar (population 55,503), Bromley (population 63,970), and Bow (population 40,293), and the estimated population of 1920 for death-rate was 159,776. The following were the principal statistics for the three districts compared with those for the County of London as a whole:—

| | Poplar. | Bromley. | Bow. | County. |
|---|---|---|---|---|
| Birth-rate .. .. .. | 33·13 | 35·82 | 32·77 | 26·5 |
| Death-rate .. .. .. | 14·73 | 14·55 | 14·96 | 12·4 |
| Infant mortality rate .. | 83·10 | 75·85 | 90·77 | 75·0 |
| Tuberculosis death-rate | 1·78 | 1·57 | 1·58 | 1·26 |

Dr. F. W. Alexander reports that 10 true cases of small-pox occurred during the year and that 3 of the patients from Bromley died. Four successful prosecutions for smoke nuisances were undertaken. The tuberculosis officer reports that the dispensary in Bow-road is unsuitable owing to noise and that the Council are negotiating for new premises. Surgical tuberculosis is dealt with by agreement with the London Hospital. An X ray apparatus is in constant use at the dispensary for diagnostic purposes. A proposed dental clinic awaits the approval of the Ministry of Health. A "care" committee meets fortnightly, but no arrangements exist for finding employment for patients and the labour bureaus are of little or no value to the tuberculous patient. The council have now taken over the work of the Poplar Infant Welfare Association. The antenatal clinic is not a success as yet. Sixty-one cases of ophthalmia neonatorum were notified; 57 recovered, 1 died, 1 removed, and 2 were in hospital at the end of the year. A dental clinic was opened in April.

*Wandsworth.*

The estimated population in 1920 of the Metropolitan Borough of Wandsworth (for death-rate) was 346,990. The birth-rate was 21·03; the corrected death-rate was 10·36; the infant mortality rate was 64, to be compared with 86 for the previous decade; the death-rate from phthisis was 0·75 and from other forms of tuberculosis 0·18. The pulmonary tuberculosis rate "is much the lowest on record." Dr. P. Caldwell Smith quotes the remarks of the magistrate in dismissing a case brought for giving a false warranty for milk: "In my opinion the borough councils of London will never get things right till they one and all intimate that it is useless to prosecute until the law is put into a reasonable shape in this matter." X ray work and throat examinations are carried out at the tuberculosis dispensary at St. Thomas's Hospital. Little is apparently done for surgical tuberculosis. Dental treatment is provided for the tuberculous by an arrangement with the British Dentists' Hospital. "The greatest difficulty has been experienced in finding suitable employment for those who are well enough to do some work." Dr. Smith gives particulars of the state of health at the end of 1919 of the cases of active pulmonary tuberculosis dealt with by the dispensary during the six years 1913 to 1918. There were 1564 in all, of whom 334 removed; of the remaining 1230, 54·5 per cent. are dead, 15·4 per cent. are in an advanced stage, 6·8 per cent. are stationary, 23·3 per cent. have improved. Tuberculin is only being rarely used as a diagnostic and much less frequently than formerly for curative purposes. Wandsworth has a very complete maternity and child welfare scheme. There are seven infant welfare centres and it is hoped to open an eighth shortly. Till recently the council have sent confinement cases to the Clapham Maternity Hospital and private maternity homes. A new maternity home with accommodation for 23 patients was opened in November and is to be maintained by the borough council. The building was purchased as a borough war memorial, the amount required being raised by voluntary subscription. Sixty cases of ophthalmia neonatorum were notified. "Twenty-six cases were treated in hospital as out-patients, 11 as in-patients, and the remainder were treated at home. Three cases removed from the district before recovery and one died. In three cases the sight has been impaired." A "home help" has been engaged in connexion with one of the centres. She "is paid 30*s.* a week with outdoor uniform and overall, fares being allowed up to 2*s.* 6*d.* a week. She is required to work eight hours a day and do whatever is necessary in the home—Saturday afternoons and Sundays excepted. The mothers book her services for confinement or sickness and pay a contribution according to their means to the infant welfare centre. No money is paid by them to the home help nor are meals provided."

*Holborn.*

Dr. W. A. Bond submits his farewell report for 1920 after 26 years' work in the Metropolitan Borough of Holborn, and refers to the improvements which have taken place during his tenure of office. He mentions housing improvements, improvements in meat inspection, in scavenging, and the control of tenemented property. The death-rate went down from 24·4 in 1895 to 14·4 in 1913; the phthisis death-rate was 3·24 in 1895 and 1·13 in 1920; the infant mortality rate was 185 in 1895 and 66 in 1920. The population of Holborn is a declining one and is estimated at 39,676

for the year 1920. The birth-rate rose from 13·6 in 1919 to 20·8 in 1920. The death-rate in 1920 was 15·2. The legitimate infant mortality-rate was 60, the illegitimate rate being 128. Dr. Bond expresses his satisfaction that the Holborn Council have approved the methods advocated by the Society for the Prevention of Venereal Disease. It is good to read in the account of the maternity and child welfare scheme that the Holborn Council are giving much attention to dental treatment. In addition to a dental clinic for expectant and nursing mothers, evening dental clinics have been arranged for men and boys not attending school and also for tuberculous patients. Of 16 cases of ophthalmia neonatorum notified, one of the children died, three left their former address, and the remainder were reported to have recovered.

## SCHOOL MEDICAL SERVICE.

### *Colchester.*

THE whole of the public health services of this ancient borough are under one executive officer. A blemish is the absence of a cleansing station. Dr. W. F. Corfield reports: "The time is not far distant when serious consideration must be given to the advisability of providing cleansing arrangements for children suffering from scabies." Naturally under these conditions it follows that impetigo "is one of the diseases that flood the minor ailments clinic." There is no nursery school in Colchester, and as children are admitted at the age of 4 the need for one is not regarded as pressing. A physical training organiser has recently been appointed with good results, and a class for defective speech training has been instituted. The number of children who underwent routine medical inspection was 1772. Of these 384 were referred for treatment, and in 201 cases treatment was obtained. 3120 dental inspections were made, and out of 1483 referred for treatment in 530 cases this was obtained. Out of 115 cases referred for treatment on account of visual defect, in 112 cases it was available.

### *Gloucestershire.*

During the year about 15,000 routine examinations were made. Only 25 per cent. of the parents were present. Out of 7903 dental inspections 59 per cent. were found to require treatment, and in 61 per cent. of these cases it was obtained under the authority's scheme; 26 per cent. refused treatment, as against 31 per cent. in 1915; 218 children suffered from ear defects, in addition to 442 requiring observation; 315 cases of enlarged tonsils and 62 of adenoids required treatment, 3905 being kept for observation; 1402 children suffered from organic heart diseases, and 107 from anæmia. Definite pulmonary tubercle was found in 7 cases, and there were 13 suspected cases; 55 children were kept under observation for rickets. 79 per cent. of all defects requiring treatment received it, 21 per cent. of these being cured, 41 per cent. improved, 16 per cent. unchanged. Less than 50 per cent. of the children were unvaccinated. There is an excellent detailed summary of the year's work. Dr. J. Middleton Martin has made a comparative analysis of conditions for the pre-war period of 1908 to 1915, with the period 1916 to 1920. A comparison is made of nutrition in the two periods, nutrition in the second period being above average in 292 cases to every 100 cases in the first; while average heights and weights showed very little difference, in fact, above the age of nine the weights in the second period are 1 to 2 per cent. below those in the first. The method of estimating nutrition is interesting; the inspector makes a note on the card of each child as to the general impression conveyed, whether "above average," "average," or "below average." The comparative tables, which might have been analysed to a useful degree, are of little value, comprising as they do a mixture of various age and sex groups in no defined proportions.

### *Derbyshire.*

Dr. Sidney Barwise, who is the school medical officer, acknowledges Dr. G. K. Thompson, his senior assistant, as the author of the report, a too unusual courtesy in regard to a quite usual condition. The report has been delayed by the preparation of the detailed and complex tables now required by the Board of Education. "There is a strong tendency for numerical records of treatment to overshadow prevention of disease." The number of children medically examined throughout the year was 29,342, as compared with 26,874 in 1919. Of these 26,534 were routine inspections; 6526 parents attended medical inspection; 457 children were temporarily excluded from school on account of tuberculosis, and 225 on account of their verminous condition. The number of children suffering from malnutrition showed a reduction this year. "The principal meal in colliers' homes is often about 2–2.30 P.M., and the children have to be satisfied with a makeshift. The want of a good midday meal is undoubtedly a principal cause." The fact that in 72·5 per cent. of invalid crippled cases the trouble began before 5 years of age emphasises the necessity for nursery schools. "It is the duty of our school nurses, as health visitors and inspectors under the Notification of Births Act, to visit each child regularly during the first five years of life, and already there have been many cases where incipient disease has been detected and checked through their vigilance. How much more easily and surely could this be done if the child attended a nursery school." As a result of the school nurses acting as nurses under the Maternity and Child Welfare Act, the proportion of salaries chargeable to the Education Committee has dropped from 33 to 23 per cent. The three dentists are assisted by five dental dressers. Sixty closures of schools, mostly for measles, were, as a rule, too late to prevent the spread of the disease. The ophthalmic work is well done so far as provision has been made. Two cases of xerosis with night blindness, cured on the vitamin theory with cod-liver oil, are noted. A half-tone block of tonsils and adenoids removed is of interest. Of 205 tonsils removed at the Derby clinic, 91, or 45 per cent., were demonstrated to be infected with tubercle bacilli. They were for the most part accompanied by enlarged glands which disappeared after operation. Further details of this investigation would be of interest. Dr. Barwise considers that the results of physical drill so far have been disappointing. He points out that the majority of deformities are preventable. With this object in view the authority has appointed a supervisor of physical exercises. This is an excellent report of work which, if allowed greater freedom, would rapidly advance knowledge.

## VITAL STATISTICS OF LONDON

### DURING AUGUST, 1921.

IN the accompanying table will be found summarised statistics relating to sickness and mortality in the City of London and in each of the metropolitan boroughs. With regard to the *notified cases of infectious disease* it appears that the number of persons reported to be suffering from one or other of the ten diseases notified in the table was equal to an annual rate of 8·5 per 1000 of the population, estimated at 4,531,971 persons in the middle of 1920; in the three preceding months the rates had been 9·6, 9·4, and 10·3 per 1000. Among the metropolitan boroughs the lowest rates from these diseases were recorded in Fulham, St. Marylebone, Hampstead, Holborn, Lambeth, Wandsworth, and Lewisham; and the highest in Hackney, Finsbury, Shoreditch, Bethnal Green, Stepney, and Bermondsey. The prevalence of *enteric fever* was about equal to that in the preceding month; of the 43 cases notified during the five weeks ended Sept. 3rd, 6 cases belonged to Deptford, 4 to St. Pancras, 4 to Wandsworth, and 3 each to the boroughs of Kensington, Stepney, Poplar, Lambeth, and Greenwich. There were 32 cases of enteric fever under treatment in the Metropolitan Asylums Hospitals at the end of the month, against 18, 23, and 27 at the end of the three preceding months; the weekly admissions averaged 5, against 5, 4, and 5 in the three preceding months. The prevalence of *scarlet fever* was 20 per cent. less than in the

## ANALYSIS OF SICKNESS AND MORTALITY STATISTICS IN LONDON DURING AUGUST, 1921.

*(Specially compiled for* THE LANCET.)

| CITIES AND BOROUGHS. | Estimated civil population, 1920. | Notified Cases of Infectious Disease. | | | | | | | | | | | | Deaths from Principal Infectious Diseases. | | | | | | | | Deaths from all causes. | Death-rate per 1000 living. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Enteric fever. | Other continued fevers. | Small-pox. | Scarlet fever. | Diphtheria.* | Erysipelas. | Poliomyelitis and polioencephalitis. | Encephalitis lethargica. | Cerebro-spinal fever. | Puerperal fever. | Total. | Annual rate per 1000 persons living. | Enteric fever. | Small-pox. | Measles. | Scarlet fever. | Whooping-cough. | Diphtheria.* | Diarrhœa and enteritis (under 2 years). | Total. | Annual rate per 1000 persons living. | | |
| **LONDON** ... ... | **4,531,971** | **43** | — | — | **2351** | **1052** | **162** | **13** | **5** | **9** | **38** | **3673** | **8·5** | **7** | — | **24** | **13** | **56** | **80** | **658** | **838** | **1·9** | **4615** | **10·6** |
| *West:* | | | | | | | | | | | | | | | | | | | | | | | | |
| Paddington ... | 149,673 | 2 | — | — | 62 | 26 | 9 | 1 | — | — | 2 | 102 | 7·1 | 1 | — | — | — | 5 | 1 | 15 | 22 | 1·5 | 124 | 8·6 |
| Kensington... ... | 164,177 | 3 | — | — | 74 | 44 | 5 | — | — | — | 1 | 127 | 8·1 | — | — | — | — | 1 | 7 | 22 | 30 | 1·9 | 191 | 12·1 |
| Hammersmith... | 136,200 | — | — | — | 58 | 33 | 3 | 1 | — | — | — | 95 | 7·3 | — | — | — | — | 1 | 4 | 11 | 16 | 1·2 | 120 | 9·2 |
| Fulham ... ... | 158,621 | 2 | — | — | 36 | 25 | 9 | 2 | — | — | 2 | 76 | 5·0 | 1 | — | — | 2 | 2 | 3 | 25 | 33 | 2·2 | 164 | 10·8 |
| Chelsea ... ... | 62,987 | 2 | — | — | 20 | 10 | 2 | — | — | — | 4 | 38 | 6·3 | — | — | — | — | — | — | 6 | 6 | 1·0 | 53 | 8·8 |
| CityofWestmin'r | 132,615 | — | — | — | 64 | 15 | 4 | — | — | 1 | 2 | 86 | 6·8 | — | — | — | — | — | 3 | 4 | 7 | 0·6 | 96 | 7·5 |
| *North:* | | | | | | | | | | | | | | | | | | | | | | | | |
| St. Marylebone... | 101,856 | — | — | — | 34 | 16 | 1 | — | — | 1 | 1 | 53 | 5·4 | 1 | — | — | 1 | 1 | 1 | 6 | 10 | 1·0 | 100 | 10·2 |
| Hampstead ... | 91,519 | — | — | — | 20 | 18 | 1 | — | — | — | 1 | 40 | 4·6 | — | — | — | — | 1 | 1 | 3 | 5 | 0·6 | 56 | 6·4 |
| St. Pancras... ... | 228,178 | 4 | — | — | 114 | 39 | 7 | — | 1 | — | — | 165 | 7·5 | — | — | 3 | — | 3 | 4 | 16 | 26 | 1·2 | 212 | 9·7 |
| Islington ... ... | 335,907 | — | — | — | 175 | 94 | 12 | — | — | — | 5 | 286 | 8·9 | — | — | 2 | 2 | 3 | 6 | 42 | 55 | 1·7 | 343 | 10·6 |
| Stoke Newington | 52,984 | 1 | — | — | 25 | 15 | 1 | 1 | — | — | — | 43 | 8·5 | 1 | — | — | — | 1 | — | 2 | 4 | 0·8 | 43 | 8·5 |
| Hackney ... ... | 225,372 | — | — | — | 164 | 87 | 3 | — | 1 | — | 1 | 256 | 11·8 | — | — | — | 2 | 1 | 1 | 39 | 43 | 2·0 | 209 | 9·7 |
| *Central:* | | | | | | | | | | | | | | | | | | | | | | | | |
| Holborn ... ... | 39,676 | 2 | — | — | 15 | 5 | — | — | — | — | — | 22 | 5·8 | — | — | — | — | — | — | 2 | 2 | 0·5 | 34 | 8·9 |
| Finsbury ... ... | 78,291 | — | — | — | 73 | 28 | 13 | — | — | — | 1 | 115 | 15·3 | — | — | — | — | 3 | 3 | 10 | 16 | 2·1 | 84 | 11·2 |
| City of London... | 14,447 | — | — | — | 11 | — | 1 | — | — | — | — | 12 | 8·7 | — | — | — | — | — | — | 1 | 1 | 0·7 | 8 | 5·9 |
| *East:* | | | | | | | | | | | | | | | | | | | | | | | | |
| Shoreditch... ... | 102,044 | 2 | — | — | 98 | 55 | 4 | — | — | 1 | 1 | 161 | 16·5 | — | — | — | 1 | — | 5 | 41 | 47 | 4·8 | 125 | 12·8 |
| Bethnal Green... | 114,471 | 1 | — | — | 92 | 41 | 7 | — | 1 | — | 1 | 143 | 13·0 | — | — | 1 | — | 3 | 2 | 40 | 46 | 4·2 | 157 | 14·3 |
| Stepney ... ... | 241,770 | 3 | — | — | 236 | 81 | 8 | — | 1 | — | 1 | 330 | 14·2 | — | — | 8 | 1 | — | 4 | 65 | 78 | 3·4 | 305 | 13.2 |
| Poplar ... ... ... | 159,766 | 3 | — | — | 99 | 42 | 7 | 1 | — | 1 | 1 | 154 | 10·1 | 1 | — | 8 | — | 6 | 6 | 41 | 62 | 4·0 | 199 | 13·0 |
| *South:* | | | | | | | | | | | | | | | | | | | | | | | | |
| Southwark... ... | 187,142 | — | — | — | 75 | 43 | 17 | — | — | — | 1 | 136 | 7·6 | — | — | — | — | 1 | 3 | 41 | 45 | 2·5 | 227 | 12·6 |
| Bermondsey ... | 129,189 | 1 | — | — | 104 | 51 | 7 | — | — | 1 | 1 | 165 | 13·3 | — | — | 2 | 1 | 1 | 7 | 18 | 29 | 2·3 | 159 | 12·8 |
| Lambeth ... ... | 293,572 | 3 | — | — | 97 | 34 | 6 | 1 | — | 1 | 6 | 148 | 5·3 | — | — | — | — | 2 | 4 | 58 | 64 | 2·3 | 327 | 11·6 |
| Battersea ... ... | 165,654 | — | — | — | 92 | 58 | 5 | 1 | — | 1 | — | 157 | 9·9 | — | — | — | — | 4 | 4 | 14 | 22 | 1·4 | 160 | 10·1 |
| Wandsworth ... | 346,990 | 4 | — | — | 112 | 51 | 6 | 1 | — | 1 | — | 175 | 5·3 | 1 | — | — | 1 | 3 | 1 | 26 | 32 | 1·0 | 302 | 9·1 |
| Camberwell ... | 284,712 | — | — | — | 129 | 51 | 8 | 1 | 1 | — | — | 190 | 7·0 | — | — | — | 2 | 6 | 5 | 27 | 40 | 1·5 | 276 | 10·1 |
| Deptford ... ... | 115,636 | 6 | — | — | 70 | 15 | 3 | — | — | — | — | 94 | 8·5 | — | — | — | — | 2 | — | 23 | 25 | 2·3 | 148 | 13.3 |
| Greenwich ... ... | 102,408 | 3 | — | — | 46 | 20 | 5 | 1 | — | — | 2 | 77 | 7·8 | 1 | — | — | — | 2 | — | 11 | 14 | 1·4 | 109 | 11·1 |
| Lewisham ... ... | 174,438 | — | — | — | 74 | 18 | 4 | 2 | — | — | 1 | 99 | 5·9 | — | — | — | — | 2 | 1 | 24 | 27 | 1·6 | 131 | 7·8 |
| Woolwich ... ... | 141,666 | 1 | — | — | 82 | 37 | 4 | — | — | 1 | 3 | 128 | 9·4 | — | — | — | — | 2 | 4 | 25 | 31 | 2·3 | 153 | 11·3 |

* Including membranous croup.

preceding month; this disease was proportionally most prevalent in Hackney, Finsbury, the City of London, Shoreditch, Bethnal Green, Stepney, and Bermondsey. The Metropolitan Asylums Hospitals contained 3408 scarlet fever patients at the end of the month, against 3375, 3621, and 3722 at the end of the three preceding months; the weekly admissions averaged 467, against 507, 506, and 567 in the three preceding months. The prevalence of *diphtheria* was 16 per cent. less than in July; the greatest proportional prevalence of this disease occurred in Hackney, Finsbury, Shoreditch, Bethnal Green, Stepney, Bermondsey, and Battersea. The number of diphtheria patients under treatment in the Metropolitan Asylums Hospitals, which had been 2121, 1896, and 1969 at the end of the three preceding months, numbered 1709 at the end of August; the weekly admissions averaged 209, against 241, 235, and 250 in the three preceding months. *Erysipelas* was proportionally most prevalent in Paddington, Fulham, Finsbury, the City of London, Bethnal Green, Southwark, and Bermondsey. Of the 13 cases of *poliomyelitis* or *polioencephalitis*, 2 belonged to Fulham and 2 to Lewisham. Five cases of *encephalitis lethargica* were notified during the month, against 18, 10, and 9 in the three preceding months. The notified cases of *cerebro-spinal fever* numbered 9, against 11, 5, and 7 in the three preceding months. The 38 cases of *puerperal fever* included 6 in Lambeth, 5 in Islington, 4 in Chelsea, and 3 in Woolwich.

The *mortality statistics* in the table relate to the deaths of civilians actually belonging to the several boroughs, the deaths occurring in institutions having been distributed among the boroughs in which the deceased persons had previously resided. During the five weeks ended Sept. 3rd, the deaths of 4615 London residents were registered, equal to an annual rate of 10·6 per 1000; in the three preceding months the rates had been 11·2, 9·4, and 9·8 per 1000. The death-rates ranged from 5·9 in the City of London, 6·4 in Hampstead, 7·5 in the City of Westminster, 7·8 in Lewisham, 8·5 in Stoke Newington, and 8·6 in Paddington, to 12·6 in Southwark, 12·8 in Shoreditch and in Bermondsey, 13·0 in Poplar, 13·2 in Stepney, 13·3 in Deptford, and 14·3 in Bethnal Green. Nine deaths from *influenza* were registered during the month, against 77, 30, and 15 in the three preceding months and an average of 32 in the corresponding period of the five preceding years. The deaths from the *principal infectious diseases* given in the table numbered 838; of these, 7 resulted from enteric fever, 24 from measles, 13 from scarlet fever, 56 from whooping-cough, 80 from diphtheria, and 658 from diarrhœa and enteritis among children under two years of age. Among the metropolitan boroughs the lowest death-rates from these diseases were recorded in the City of Westminster, Hampstead, Stoke Newington, Holborn, and the City of London, and the highest in Shoreditch, Bethnal Green, Stepney, and Poplar. The 7 fatal cases of enteric fever were 2 fewer than the average. The 24 deaths from *measles* were only one-half of the average number; of these, 8 belonged to Stepney and 8 to Poplar. The 13 fatal cases of scarlet fever exceeded the average by 7; of these, 2 belonged to each of the boroughs of Fulham, Islington, Hackney, and Camberwell. The 56 deaths from *whooping-cough* were double the average number; the greatest proportional mortality from this disease occurred in Paddington, Finsbury, Bethnal Green, Poplar, and Battersea. The 80 fatal cases of diphtheria were 33 in excess of the average; this disease was proportionally most fatal in Kensington, Finsbury, Shoreditch, Poplar, and Bermondsey. The deaths from *infantile diarrhœa* numbered 658 and exceeded the average by 464. This is the largest number of deaths from infantile diarrhœa recorded in London in August since the corresponding period of 1914 when they numbered 711; the greatest proportional mortality from this disease occurred in Shoreditch, Bethnal Green, Stepney, Poplar, Southwark, Lambeth, and Deptford. In conclusion, it may be stated that the aggregate mortality in London during August from these principal infectious diseases was 152 per cent. above the average in the corresponding period of the five preceding years.

THE LATE DR. WILLIAM BARNETT BENJAFIELD.—Dr. Benjafield, a retired practitioner, who died on Sept. 13th in his sixty-fifth year, was a graduate of Edinburgh University, where he qualified M.B., C.M. in 1882, in the same year taking the M.R.C.S. Eng. He was a man of wide interest in the profession, having been physician to the Tottenham and Edmonton General Dispensary, assistant demonstrator of anatomy at the University of Edinburgh, and house surgeon in the ophthalmic wards of the Royal Infirmary. Dr. Benjafield was at one time specially interested in the treatment of consumption under the Poor-law, contributing a paper on the subject to the *Poor Law Officers Journal* in 1902.

# HOUSING NOTES.

### *Building Guilds.*

THE Government's refusal for a certain period to enter into further contracts to aid the building of houses has by no means quenched the interest appertaining to housing at the present time. Old problems have acquired a new liveliness; ideals arising out of the war have produced new methods. To these ideals Building Guilds owe their origin. Building Guilds stand for complete democratic control within the industry and for complete publicity as to costs, charges, and prices. The fact that work on 13 building schemes (two in London and 11 in the provinces) has been commenced shows that they represent a practical proposition. Mr. Ernest Selley, an independent investigator who has collaborated with Mr. Seebohm Rowntree and Captain Reiss in the past, has visited five sites involving the building of 986 houses; at three, many houses were nearly finished and the work was sufficiently advanced to provide a basis for a considered opinion as to the probable success of the Guilds. Informal inspections of the building operations were first made and the workmen questioned, later the Guild officials on the site were cross-examined impartially. All the workmen appeared to be working with a will, even in the absence of the foreman. The clerks of the works, the best judges, were all pleased with the output; some found that the output on Guild schemes are 25 per cent. above the average for similar work for other contractors. The standard of the work is high. Guilds reserve the right to pay the workmen full wages in wet weather or fine, in sickness or on holiday. In Manchester for the last quarter of 1920, in spite of much rainy weather, the money paid for time not worked was less than 1 per cent. of the total wages paid. No figures are available as to the actual cost, but Mr. Selley holds that in the schemes visited all the evidence goes to show that the final costs would be considerably below contract figures. For the Walthamstow Council Scheme for 400 workmen's dwellings the accepted estimate of the London Guild was about £36 per house less than the lowest estimate submitted by the private contractors. The Guild agreement provides that the price shall be the prime cost of material and labour at standard rates, together with an additional 6 per cent. to cover head office administration expenses, plant, insurance, and, if necessary, interest on borrowed capital. To this is added an allowance of £40 a house to enable the Guild to guarantee continuous pay to its workmen in all contingencies. Sir Alfred Mond, as shown by his speeches in the House of Commons, evidently prefers the contract system, but is willing to consider the Building Guilds if they can prove the claims made for them.

### *The Standard of Home-Making.*

An old problem has come more into the light. Many local authorities have recently for the first time become responsible for the management of house property, and will doubtless come up against the problem of the neglectful and dirty tenant. Obviously, it is almost impossible under prevailing circumstances to make inquisitorial investigations as to the cleanliness of the present homes of the applicants for municipal houses; the war services of the men, the overcrowding, residence outside the area, hinder such inquiries. The Women's Section of the Garden Cities and Town Planning Association have recently issued a report on the management of working-class property by women, a feature inaugurated by Miss Octavia Hill in 1864. They find that where tenants dispossessed from old houses are provided for in modern dwellings, many of the incoming housekeepers have had no experience of using the new fittings. Some of the women have not known how to clean their porcelain-surfaced or painted bath or their earthenware sink, or how to manage their closed-range flues. Not only could a woman deputy manager remedy this lack of knowledge, but a skilled and tactful adviser would be able to improve the standard of housekeeping and home-making which has been lowered by overcrowding and unemployment. The Section recommend that the London University, which now grants a degree in estate management, and the College of Estate Management, should recognise the special need for the management of working-class property and make any necessary provision. The best course of training, they consider, would be one which combines the studies arranged at the Household Science Department at King's College, the London School of Economics, and the College of Estate Management, all of which are linked up to the University of London. The report goes on to condemn the undesirable means—key-money, percentage fees on builder's bills, and other "payments"—which have been practised in order to make the management of lower grade properties a paying business.

### *"Zoning."*

The spoiling of residential areas has long been with us: its cure—zoning—has only recently been mooted in this country. Probably few outside those intimately concerned with town planning have a very definite idea of the meaning of the word, although zoning of cities has been in operation in the United States since 1909, when Los Angeles established the first zoning ordinance. Zoning, as defined by the chairman of the New York (City) Committee on Districting, is "the creation by law of districts in which regulations, differing in different districts, prohibit injurious or unsuitable structures and uses of structures and land." St. Louis, U.S.A., affords an example of its practice. After 16 months' preliminary study of existing facts and probable tendencies the city was, in August, 1918, divided into five districts—first residence district for one-family houses exclusively; the second residence district for other dwellings and for tenements, hotels, institutions, &c.; the commercial district comprising important streets, not within the manufacturing part of the city, for stores and shops; the industrial district for all forms of industry not considered objectionable because of noise, odours, smoke, and dust; and the unrestricted district, chiefly along the railroad lines and the river front, which may be put to any use provided that nuisances dealt with under the existing laws are not created. Apparently the movement in favour of zoning in America derives much of its impetus from objection to the sky-scrapers which cut off light and air from too closely approaching neighbours. Other objections are the proximity of garages, with their inevitable workshops, to adjoining schools or of factories to houses. The motor lorry has enabled industrial concerns to fix their factories in the tract of residential districts; proximity to railroads is no longer necessary. Only by a lawsuit can the well-to-do protect themselves against the various forms of nuisances caused by industry; zoning affords protection and prevention for both poor and rich.

It is necessary to guard against the insidious encroachment of industry and business on residential areas; one factory or one shop brings others in its wake. Interruption of the quiet and peace of residential streets, the disturbance of sleep of children, nightworkers, or even other adults, the creation of dust by increased traffic or by dusty industries, are all arguments against allowing any encroachment on residential areas by businesses or industries. One boon which zoning would bring in the future, if not at present, is the saving of hours now spent in travel between work and home; more homes will in the future be within an easy walk of work. Zoning finds its easier application in the towns to be planned in the future; when applied to existing towns it would require to be adapted to existing conditions while serving to check undesirable tendencies.

To prevent injustice no alterations in the use of districts would be made unless a substantial majority of the property owners affected gave their consent, the final decision resting with the municipal authority.

Each scheme should be framed with consideration for property rights; if, after this, individual owners feel themselves aggrieved, these grievances cannot be allowed to stand in the way of the public ideal.

In New York City the zoning ordinance has prevented depreciation in the value of property; areas which had been practically abandoned for several years by good-class residents have been rehabilitated. During the four and a half years of its adoption little disapproval has been shown, while no significant changes have been made in the ordinance itself.

## MEDICINE AND THE LAW

### *Shell-shock and Perjured Evidence.*

IN the case of a man sentenced to six months' imprisonment at the Central Criminal Court for perjury, the prisoner's counsel urged in mitigation of his offence that, having been blown up by a shell at the front, he suffered from a diminished sense of responsibility. The perjury alleged had been committed in the Divorce Court where, in seeking a decree, he had sworn that he had not had relations with his wife, or lived with her since 1916. It was, however, conclusively proved from a letter produced that he had visited her often since, when on leave. Mr. Justice Acton said that it would be a dangerous principle if it were to be laid down that injuries received by a man in defence of his country excused him from the consequences of such an offence. The prevalence of perjury in the Divorce Court was also referred to by the learned judge. In comment it may be observed that the effect in diminishing self-control and sense of responsibility attributable to shell-shock, wounds, and the strain of war, is, no doubt, considerable. It can, however, well be understood that neither a judge nor a jury would attach great weight to such an explanation in the case of perjury committed by a man in his own interest, in the circumstances of deliberation and reflection attaching to evidence in a court of law.

### *Rex* v. *Starkie.*

At the Central Criminal Court R. W. Starkie, a medical practitioner who had held appointments under the police and under the St. Pancras Board of Guardians, was convicted and sentenced to nine months' imprisonment on a charge of administering to a woman, or causing to be taken by her, noxious things with intent to procure miscarriage. On three counts, charging the prisoner with using instruments to procure miscarriage upon three other women, he was acquitted. Sir Edward Marshall Hall, K.C., who defended, intimated that there would be an appeal referring in particular to the judge's ruling that the charge relating to the administering of drugs, upon which the prisoner was convicted, could be taken with the charges of using instruments. This was the case in which urgent requests by the committing magistrate and by counsel for the prosecution were addressed to the press to the effect that the names of the women witnesses, the subjects of the charges tried, should not be given in the newspapers. This does not imply that there was secrecy as to their identity, their names being given in court in the usual way. The publication of the names in the press was considered undesirable on account of the importance of securing, as witnesses in cases of the kind indicated, women who might be deterred from giving evidence by dread of the usual publicity. In his summing up Mr. Justice Acton referred to charges of the class under consideration as of deep seriousness to the defendant, possibly involving for him social, professional and financial ruin, and at the same time as of hardly less importance to the community. Cases such as this are admittedly insidious and difficult to prove.

### *The Traffic in Cocaine.*

A man, 23 years of age, described as a pugilist, and a woman, 21 years of age, were sentenced recently at Bow-street for being in unlawful possession of cocaine, the former to a term of six months' hard labour, with three months in addition if he should fail to pay a fine of £200, and the latter to one month's imprisonment. The case was of the usual kind, the man having been seen by a detective-sergeant handing something to the woman at the corner of a street near Leicester-square. Upon the detective arresting him the man dropped three packets of cocaine and the woman in like manner tried to get rid of a single packet. Hardly a week passes without similar cases being reported, and it is to be regretted that the police seem unable to check the illicit traffic in the drug at, or nearer to, its source. The persons arrested appear nearly always to be the last links in a chain of distributors, operating in the streets or in more or less disreputable bars, the early closing of the latter driving them, no doubt, to deal largely in the highway where, at any rate, they are liable to observation. In many cases it is a man who carries a small stock of cocaine in packets, and hands one or two packets at a time to a woman, who may or may not be the ultimate consumer. The profits appear to be sufficiently large to tempt those concerned in retailing small quantities to run considerable risks, but it should not be beyond the ingenuity of the police to track out the traders who at present work in comparative security.

## Obituary.

### SIR PETER JOHNSTON FREYER, K.C.B., M.D., M.CH.R.U.I.,

LATE LIEUT.-COLONEL I.M.S.; CONSULTING SURGEON TO THE QUEEN ALEXANDRA MILITARY HOSPITAL AND TO THE EASTERN COMMAND.

THE death of Sir Peter Freyer on Sept. 9th, in his seventieth year, will remind surgeons the world over how it came about that litholapaxy and suprapubic prostatectomy are to-day firmly established as the operations of choice in vesical calculus and enlargement of the prostate.

The eldest son of Samuel Freyer of Selerna, Co. Galway, Peter Johnston Freyer was educated at Erasmus Smith's College, Galway, afterwards studying medicine at Dr. Steevens's Hospital, Dublin, and at Paris. In 1872 he graduated B.A. at the Royal University of Ireland with first-class honours and gold medal. Two years after he took his M.D. degree, again with the highest distinction, as well as the M.Ch. and L.M. Later he received an honorary M.A. In 1875 Freyer entered the Indian Medical Service, obtaining first place in open competition, and was lent to the Government of the North-West Provinces, acting first as civil surgeon at Moradabad, and afterwards at Bareilly, Allahabad, Mussoorie, and Benarès, becoming surgeon to the Prince of Wales's Hospital at the last-named. He was appointed medical officer to the Lieutenant-Governor of the North-West Provinces and Oudh, and subsequently to the late Nawab of Rampur.

In India Freyer was interested in two widely different diseases, cataract and stone, both very common in the practice of a civil surgeon. It was soon after he went to India that Bigelow's operation of crushing stone in the bladder and removal at one sitting became known. The operation was not well received by Bigelow's colleagues in America, and it fell to two great Irishmen in the I.M.S., Keegan and Freyer, to place the operation in the position that it deserved. In 1894 Freyer was deputed by the Indian Government to attend on their behalf the International Medical and Surgical Congress at Rome.

After retirement from the Indian Medical Service in 1896 with the rank of honorary colonel, Freyer came to London, and two years later was appointed surgeon to St. Peter's Hospital for Stone. Prostatic surgery was then at a low ebb. McGill's operation for the removal of the intravesical portion of the enlarged

prostate had been abandoned on account of high mortality and indifferent results. White, of America, had started a crusade of orchidectomy, and vasectomy was by some surgeons being substituted for it. It was becoming increasingly evident that, in spite of much writing and many statistics, no real progress was being made. In 1901 Freyer published four cases of suprapubic prostatectomy, and claimed to remove not only the intravesical projection but the whole of the enlarged prostate. There at once arose a controversy, partly in regard to priority and partly in regard to anatomical details of the operation that lasted for some years.

One of Freyer's colleagues writes of this part of his career: "Looking back on that controversy one cannot help thinking that, although much ink was spilt and some feelings hurt, it did much good. The operation was brought well into the notice of the profession and the points of difficulty in regard to the anatomy and physiology were thrashed out so that within a comparatively short time the operation was established on a firm surgical and anatomical basis. The operation of suprapubic prostatectomy, on the lines drawn up by Freyer, is now practised throughout the surgical world.

"What of the man who achieved so much, and who raised such keen controversy? Freyer had, more than any man I have known, the power of concentration on a single issue. It was possible for him to exclude from his mind other surgical subjects, and even for the time all by-paths to which the subject might lead. Add to this a restless energy and a great driving force, and we see the character of the man. Like many of his countrymen, Freyer's best efforts were made under the stimulus of opposition. Yet he made a conscientious hospital surgeon. His attendance at hospital and the care that he expended on his cases there, until failing health rendered him unequal to the strain, was an example to his junior colleagues. It was with genuine pleasure that he accepted the post of first president to the newly formed Section of Urology at the Royal Society of Medicine and his regular attendance, sometimes in spite of physical suffering, and his evident desire to help the work of the Section will leave a lively sense of gratitude in the minds of the members and officers of the Section."

In 1904 Freyer was awarded the Arnott Memorial medal for the original research in surgery incorporated in his various works on "Modern Treatment of Stone," "Enlargement of the Prostate"—which has passed through five editions—"Surgical Diseases of the Urinary Organs," and "On the Best Methods of Removing Large Calculi from the Bladder." The size of his surgical practice may be gathered from the fact that articles which he published bear such titles as "100 Operations for Stone without a Death" and "1000 Cases of Total Enucleation of Prostate for Radical Cure of Enlargement of that Organ." During the war he was placed on the consulting staff of the Queen Alexandra Military Hospital and the Indian Hospitals at Brighton. He had also been consulting surgeon to the Eastern Command and surgeon to King Edward VII. Hospital. In recognition of all this public work he was created K.C.B. in 1917. Sir Peter Freyer married Isabella, daughter of Robert McVittie of Dublin, who predeceased him in 1914; he leaves a son and a daughter, the latter of whom is the wife of Major J. D. Grant, V.C.

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Dr. Paul Uhlenhuth, sometime professor of hygiene and bacteriology in the German University of Strassburg, has been appointed director of the Institute for Experimental Therapy at Marburg, founded by E. v. Behring.

THE R.M.S.P. yachting steamer *St. Margaret of Scotland* will commence in October a series of holiday cruises, embracing calls at Madeira, Teneriffe, and Las Palmas, the round voyage occupying about 22 days. Calls will be made at the principal ports in the islands, and the stay in port permits of excursions being made inland to points of interest.

# Correspondence.

"Audi alteram partem."

## THE CASE FOR NATIONAL HEALTH INSURANCE.

*To the Editor of* THE LANCET.

SIR,—As an attack is being made on the capitation fee and possibly on the whole question of National Health Insurance, it is necessary that the whole case be carefully examined so that the advantages, the faults, or the defects may be properly treated and the responsibility rightly adjusted.

The medical service, on which the Acts practically hang, has been subjected to much criticism, and has been searched thoroughly for the bad things, and these have been fully advertised. In many quarters it is taken for granted that the panel doctor is not only hopelessly inefficient, but that he is a brutal hard-hearted bully. Such a view does not require refuting as it is so evidently outside common sense, but yet there is an atmosphere of distrust and questioning, amongst responsible people, which has to be dispelled. An intimate knowledge of the service compels the considered opinion that as a whole it is a very good general practitioner service, that it is improving, that it will continue to improve if given a fair chance. It has been carried on under very great disabilities which have certainly not received the same publicity nor recognition from the interested parties exploiting complaints. It was started amidst the most acute and bitter political acrimony, not only amongst the general public, but amongst the medical profession. This has gravely handicapped the service all through, and it is possible that the present campaign is a resurrection of the old hates, for the same parties are again prominent. It may appear somewhat of the nature of an appeal ad misericordiam, but yet it has to be recognised that the conditions of the service, especially in an industrial area of London, are very trying. Of necessity there must be evening consulting hours which practically exclude the doctor from family and social life, or from recreation. His services are on tap at all hours, day and night. Any time he may take off is at risk of complaint. No citizen in the community occupies the same position as to hours of labour or demands for his services as the panel doctor. This does require recognition when the question of remuneration is considered. These disabilities are inherent to the service, but there are many others capable of reasonable adjustment.

As a whole the insured person is pleasant to serve and considerate, and in general the proper relations of trust between doctor and patient are established. There is practically no malingering, but a small section makes unreasonable demands. This section is naturally a noisy one, and has been consistently used by politicians, by the less responsible press, and by inefficient administrators, much to the prejudice of the service and adding considerably to the difficulties of the doctor. Again, there is the insured person who has not grasped the principle of insurance, and thinks he is being badly used because he "has been paying in and getting nothing out." Somehow he seems to think the doctor is the cause, and, if he reads the daily press, he becomes quite certain of it. There is also the "superior person" who tattles about "charity" and expects all the frills of the West End. It can be readily understood how such agents may be used to raise opprobrium on a genuine service, and how difficult it has been for the doctors to wear down a campaign carried on with deliberation for nine years. There is ample evidence, however, that the insured person is slowly but surely appreciating the value of the service.

An inquiry into the working of the service is being asked for. The medical profession would welcome an honest investigation, but their experience compels

them to hold the view that an inquiry into the administration of sickness benefit by approved societies is much more necessary. The general impression received is that the approved society has not the least concern with the sickness or circumstances of the insured person, that its aim and object is to pay out as little sickness benefit as possible, and that not sooner than can be avoided. During the war there were difficulties, and within the last year some societies have been administering sick benefit humanely and intelligently. Yet there is much room for improvement, especially on the question of certification, which is a fruitful source of irritation between patient and doctor. Although the regulations allow a certificate to cover from Sunday to Sunday, there is still much worrying for certificates on special days and times, and withholding of benefit if a certificate is not forthcoming.

In a case of death it not infrequently happens that a "final" certificate, which means capacity for work, is demanded to cover the period between the death and the last intermediate certificate, even although the agent has seen the death certificate and "viewed" the body. It would be tedious to enlarge on the vagaries and irritations of certification. It is recognised that accurate certification is necessary to cover incapacity, but it has to be approached from a different aspect than that adopted by approved societies before smooth or efficient working can be established. A survey of the inquiries on questions arising out of certification demonstrates how vexatious to the doctor certification can become. As an example, a doctor giving a good service certifies an insured person, after careful examination, as suffering from "abdominal pains." The patient is kept under observation for a week, and, as no further developments occurred, certifies her fit for work, using "abdominal pains" again. The approved society demands an inquiry for incomplete certification. The health visitor, another asset of the approved society, is of questionable value, and undoubtedly a frequent source of friction. When bandages are removed, pulses felt, tongues inspected, and when the charlady, recovering from influenza, is reported for doing a little charing for herself, it need cause no surprise that health visits are not always appreciated as they might be. The visitors are viewed as detectives watching the doctor and insured person. At one time the approved societies employed referees to "coax the lazy ones" of sick benefit at half a guinea or a guinea at a time, but this duty is now undertaken by the regional medical officers of the Ministry, at a cost to the approved society of 10*d.* a time. The Ministry has a reputation for business instinct, and as the cases are mostly chronic it is difficult to see how national health may be advanced by estimating their earning capacity to a decimal point. Yet many of these poor people are harried every three months or oftener at 10*d.* a time because the panel doctor is not supposed to be able honestly to judge their fitness for work.

It may be wondered how it happens that so little has been heard of complaints against the administration of sick benefit. This is easily explained. The only means by which an insured person can obtain redress is to apply to the disputes committee of his approved society, with a deposit of £1, which is forfeited if his complaint fails. It is when we arrive at the insurance committee, which administers medical benefit, that we get a grip of the predominating factor in the dissatisfaction. The London Insurance Committee has been from the start hostile to the panel doctor, has appeared to encourage complaints against him, and to conduct its inquiries with bias. Insured persons are not supplied with title to medical benefit for months or even years, and their title to benefit is constantly being questioned. Their names are removed from doctors' lists for this reason, although at the time their title may be such as allows them to receive sickness benefit—a position which gives occasion for unpleasantness between doctor and patient. But there is much worse than this. It will be agreed that the doctor has a right to receive information as to the extent and direction of his responsibility. Article 18 of the Medical Benefit Regulations, 1920, provides that practitioners shall be supplied by the insurance committee with a correct list of insured persons whom he has accepted. It further provides that this list shall be kept correct to date, and it is the duty of an insurance committee to supply the doctor with the necessary information. This duty has been neglected by the London Insurance Committee, and there is reason to believe that London is not alone in this respect. It would be difficult to contemplate medical service being rendered contentedly and efficiently under such circumstances. The issue of Forms Medical Record, hurried as it was, has revealed a disturbing state of affairs, calling for immediate inquiry; the errors in individual lists have been shown to be anything from 12 to 33 per cent. and of a varied character.

Having considered the effect and operation of outside influences it is possible to examine the evidence regarding the character of the medical service. During 1919, a year above the average, there were 66 inquiries. Of these 42 were substantiated. This means that one in every 25,000 insured persons felt he had a grievance, or one complaint in about 100,000 attendances, and, as several of these complaints were against the same practitioner, it would mean that 66 doctors at most out of 1500 on the panel had given cause, real or imaginary, for inquiry. Inasmuch as the insured person understands that it is his right to lodge complaints, however trivial, the comparative smallness of the number of complaints becomes very real. Highly placed approved society officials have alleged that malingering is encouraged by the medical profession. These statements have to be put against the fact that surpluses of many millions have been placed to the credit of a majority of the societies. When we consider how carefully the actuaries estimated the cost of sickness benefit in 1912, it is surely just to suggest that part at any rate of the huge surplus is due to the efficiency of the medical service; otherwise approved societies have been depriving members of their due.

No one contends that the medical service of the general practitioner on the panel is perfect, but it can with confidence be asserted that an honest inquiry would show the "panel doctor" to be as efficient as any other section of the profession, to have as strong a sense of duty, and to be as meticulously careful of his performance of that duty. All he asks is a fair chance.

I am, Sir, yours faithfully,

Champion Park, S.E., Sept. 19th, 1921. H. G. COWIE.

## SOME TOXÆMIAS OF PREGNANCY.

*To the Editor of* THE LANCET.

SIR,—In a leading article with this title in your last issue the following occurs: "The marked accumulation of urea and other nitrogenous waste products, so frequently seen in acute and certain types of chronic nephritis, is absent in the toxæmias of pregnancy. The non-protein nitrogen and urea of the blood are frequently within normal limits." And this difference, the article continues, "serves to differentiate the true eclamptic from cases of uræmia due to chronic interstitial nephritis complicating pregnancy."

I venture to ask how is it possible that "a definite nitrogenous retention" in the blood should be absent in a disease in which extensive necrosis and degeneration of liver cells and of kidney cells are the characteristic features? Does not the liver safeguard the body from the inroad of poisonous non-protein nitrogenous bodies? Is it not one of this organ's functions to transform these amino- (and allied) bodies into the innocuous urea? If, then, the liver is the seat of such a profound degeneration as is the case in the pre-eclamptic toxæmia, how can the general blood fail to become surcharged with these

non-protein nitrogenous bodies, provided the patient be eating, and the kidneys not properly working? And how do the amino-compounds (and allied bodies), absent in health, but present in the urine in these cases get into the urine? They must come in part at least from the blood. And how is their presence in the blood explained, except by an insufficiency of the liver?

Recognising Dr. Mackenzie Wallis as an authority on this matter, I have just looked up his recent article, the Toxæmias of Pregnancy.[1] I find he says much the same as the writer of THE LANCET article. This is what he says: "In toxæmias of pregnancy the results of an analysis of the blood show no striking deviations from those found in normal pregnant women. The blood urea content is usually within the normal limits. . . . The same applies to the sugar in the blood. . . ." But he says not a word about any other non-protein nitrogenous body. Throughout his article his blood test refers for the most part to the discovery of the urea content. Of course, if the patient is eating and the liver not functioning, one cannot expect as much urea to be formed as would be the case in the normal. But unless one excludes the presence of other non-protein nitrogenous bodies that may possibly be in the blood (and may possibly cause the fits), or has shown they do not occur in greater quantity than in health (Bayliss[2]), the categorical statement that in the pre-eclamptic state there is an absence of a definite nitrogenous retention seems to me unwarranted and misleading. Because, you know,[3] the occurrence of the toxæmias of pregnancy and of eclampsia, after all, may not be due to the wonderful "toxin or toxins" of which everyone is speaking. In any case, such a statement as that I have referred to coming from THE LANCET seemed to me to require clearing up, or qualification. The statement may be perfectly correct. If it is, then I can only suppose that the functions of the liver are limited to the storing of carbohydrate, the formation of bile, and possibly others, but that its supposed urea production is an exaggeration. And I must suppose when an Eck's fistula is made in the dog and the animal is given meat that the ensuing convulsions are the result either of a depletion of carbohydrate in the liver (as Prof. Harding suggests is the cause of pernicious vomiting[4]), or that it is the result of an experimental error, and in any case is to be neglected.

I am, Sir, yours faithfully,

R. H. PARAMORE, F.R.C.S. Eng.

Rugby, Sept. 17th, 1921.

[1] Journ. of Obstet. and Gyn. of the Brit. Emp., vol. xxviii. No. 1 (New Series), Spring, 1921, p. 11.
[2] Principles of General Physiology, 1920, p. 265 (first two lines).
[3] Some Problems of Midwifery, THE LANCET, July 12th, 1913, p. 87.
[4] Nausea and Vomiting in Pregnancy, THE LANCET, August 13th, 1921, p. 327.

## VERONAL AGAINST SEA-SICKNESS.

*To the Editor of* THE LANCET.

SIR,—Dr. T. Zangger's experience (THE LANCET, Sept. 17th, p. 630) agrees with my own, though, fortunately, mine was not acquired in my own person. In 1912, while acting as surgeon in the Union Castle Co., I had an exceedingly troublesome case of sea-sickness in a woman who was previously suffering from the vomiting of pregnancy. There were several other doctors on board and one of them (I believe Dr. Ashe of Kimberley) advised me to try veronal. I did not carry any in stock but managed to collect enough from passengers to go on with. I had had no previous experience of this drug other than as a sleeping-draught, so was afraid to push it. As long as the patient was under the influence of veronal the vomiting ceased and when it recurred it was checked by a further dose. The patient arrived safely though very weak. A second pregnant woman in a later voyage became sea-sick; I gave her a 10-grain dose on my morning round and by 5 o'clock she was quite cheery. A second attack a few days later was checked permanently by one dose. As far as I remember, out of all the cases in which I used the drug (and I used no other) only one failed to respond to a 10-grain dose.

My experience of treating sea-sickness was not nearly as large as I should have expected, as most people seem to prefer to suffer in solitude unless the attack is very severe.

I am, Sir, yours faithfully,

Clevedon, Somerset, Sept. 19th, 1921. R. L. WASON.

## TRYPANOSOMIASIS: A NEW METHOD OF TREATMENT.

*To the Editor of* THE LANCET.

SIR,—With reference to the paper on this subject read by Dr. C. H. Marshall, senior medical officer to the Uganda Protectorate, at the Royal Society of Tropical Medicine and Hygiene (THE LANCET, June 4th, p. 1185), I am surprised that neither in this paper nor during the subsequent discussion was any mention made of the fact that this method of treatment was suggested as far back as 1907 by Thiroux and d'Aufreville, who wrote[1] as follows:—

"There is reason to conjecture that sero-therapy will not give results in meningeal trypanosomiasis unless the antitoxin is injected into the spinal canal or cerebral substance, as has been done for tetanus antitoxin."

No statement can be clearer than this. During 1909 a review[2] under the heading "A Suggestion for Treatment," by Dr. Andrew Balfour, goes on to say:—

"In a memorandum headed 'The Treatment of Sleeping Sickness: A Suggestion,' forwarded to the Bureau by Colonel Mathias, R.A.M.C., President of the Sudan Sleeping Sickness Commission, and dated Nov. 17th, 1908, Dr. Andrew Balfour draws attention to the results obtained by Drs. Mackenzie and Martin, in the treatment of cerebro-spinal meningitis 'by their method of introducing locally by spinal puncture a highly immune serum which they had obtained from the blood of patients who had recently recovered from the disease or, as in two successful acute cases, who were still running a course. The latter were injected with their own sera taken on the sixth and seventh day of their illness respectively.'

"He suggests a similar use of serum-therapy in cases of trypanosomiasis. He mentions some points in which the diseases resemble one another. He asks if in sleeping sickness the cerebro-spinal fluid is a locus minimæ resistentiæ, does it lack trypanocidal substances? He proposes a combined therapy, the trypanosomes being attacked in the blood by some of the more promising of our present drugs, in the cerebro-spinal fluid by the injection of the patient's own serum or the serum from a case improving under treatment, obtained by defibrinating and centrifuging the blood.

"Dr. Balfour's suggestion is well worth attention. As appears more than once in this number many cases have been met with in which trypanosomes persisted in the cerebro-spinal fluid when they could no longer be found in the blood or glands. Martin and Leboeuf found in one instance that tartar emetic, while it cleared the blood of parasites, was without effect on those in the cerebro-spinal fluid. If the action on the parasites is direct this might indicate that the drug does not readily permeate the meninges, and hence is never present within them except in a more dilute state than elsewhere in the body. That this may be so is suggested by Nierenstein's observation that arsenic was absent from the cerebro-spinal fluid of an injected donkey on the first day but appeared on the second. If the action of the drug is indirect the want of trypanocidal substance may be due to the poverty of the cerebro-spinal fluid in cellular elements, as Balfour suggests."

Dr. Andrew Balfour, therefore, went a step further when he suggested that the blood serum of patients under treatment with some trypanocide should be used for intrathecal injection. It will be observed from these passages that Prof. Halliburton's expression that "he took exception to scientific workers remaining in the clouds and avoiding propositions of practical importance" is by no means accurate; for it is obvious that the resistance of the meninges against permeation by curative agents introduced in the blood stream was prominently borne in mind by the observers

[1] Bulletin of the Sleeping Sickness Bureau, No. 6, 1909, footnote, p. 223.
[2] Ibid., No. 4, 1909, p. 163.

of that day. Further than this, Nierenstein's researches appear to invalidate Prof. Halliburton's statement that the cells lining the choroid plexus constitute an absolute barrier preventing arsenic from entering the cerebro-spinal fluid.

It might not be out of place to draw attention to the past literature on this subject, more especially to the period when inquiry into every form of therapeutics in connexion with trypanosomiasis was at the height of its activity. Consequent on important work on sera by Schilling (1905), Klein and Möllers (1906), Mesnil and Brimont[3] studied this question and an extract from a review of their paper is as follows :—

"Action in vitro of the serums on the trypanosomes.—The trypanosomes of the last experiment after half-an-hour's contact with active serums showed a vitality as great as that of the control trypanosomes. It was thought possible that the effect of the serums might be evident later. Trypanosomes were therefore put in contact with active serums, inactive serums, and in the citrated water with which they were diluted, in each case at 18° and 37°. In a great number of trials no microbicidal action was observed; the active serums behaved like the inactive; in both the trypanosomes kept their vitality longer than those in the citrated water; it was kept longer still when heated serums were used. The protective power of the serums is therefore not due to trypanolytic action. The two properties, when they exist together, are independent. Nor did the addition of serum from the mouse to supply complement bring about trypanolysis. The agglutinating power of the serums was very inconstant, and never well marked; it exists also in some fresh serums; agglutinative power has no sort of relation to protective power. Anti-lewisi serum is the only one for which agglutination is characteristic, and here Laveran and Mesnil have shown the independence of agglutinating and preventive power."

Following on the work of Laveran and Mesnil, Goebel,[4] among other conclusions, found that—

(1) Human serum digested at 37° with trypanosomes does not lose its preventive and curative properties. The parasites which have remained in it preserve their infectivity completely.

(2) "Human serum does not show any opsonic or cytotropic property as regards trypanosomes. In any case it does not change the parasites so as to make them an easy prey for leucocytes."

Research undertaken by Levaditi and Mutermilch is described[5] as follows :—

"The authors mixed trypanosomes from the blood of a mouse with serum from guinea-pigs killed in the course of a third relapse, and added complement. At 38° the degree of trypanolysis was proportional to the quantity of trypanocidal serum added. With certain quantities microscopical examination showed that all the parasites were immobile and had become round and transparent. It was thought that sterilisation was complete, but when some of these mixtures were injected into mice the animals became infected with trypanosomes and died. The authors suggested that those parasites which had succeeded in multiplying in the blood of the mice had become resistant to the antibodies with which they were in contact in the test-tube: experiment showed that it was so."

From the above it would appear that the blood serum of animals, whether suffering from trypanosomiasis or not, contains little if any trypanolysin, and that trypanosomes kept for some time in contact with such sera do not lose their infectivity; in fact, according to later researches, they become in certain cases resistant. The conclusions that Dr. Marshall arrives at and the hopes expressed that "in man prophylaxis and immunisation against trypanosome infection might be so attained"—i.e., by the use of animal serums—are certainly not supported by the researches of many eminent workers, and are also perhaps not without danger.

Regarding complement-fixation, Beck's experiments, like those of previous workers, led to no practical conclusions. He doubts whether complement-fixation will ever become of use in the diagnosis of human trypanosomiasis."[6] As Dr. Marshall appears to have had such promising results, we trust that he will be given ample opportunity for continuing his work, and if he can bring it to a satisfactory termination he will have achieved remarkable success. I am sure we all wish him the best of luck.

I am, Sir, yours faithfully,

Dar-es-Salaam, July 14th, 1921. J. O. SHIRCORE.

*** Dr. Shircore's letter makes it clear that intrathecal serum treatment for trypanosomiasis was tried even earlier than was suggested in an annotation on Sept. 10th, p. 573.—ED. L.

[3] Review in Bulletin, S.S.B., No. 6, 1909, p. 220.
[4] Bulletin, S.S.B., No. 7, 1909, p. 259.
[5] Ibid., No. 8, 1909, p. 330.
[6] Ibid., No. 21, 1910, p. 350.

## NATIONAL PROVIDENT SCHEME.

*To the Editor of* THE LANCET.

SIR,—In the National Provident Scheme for Hospital and Additional Medical Services in London, as detailed in your current issue, is there intended to be any differentiation between earned income and income derived from capital? If there is no such differentiation, what is to prevent an individual, with an income of £250 derived from invested capital of £5000, from becoming a member at an annual subscription of £1?—I am, Sir, yours faithfully,

C. HAMILTON WHITEFORD.

Plymouth, Sept. 17th, 1921.

# The Services.

## WOMEN'S MEDICAL SERVICE FOR INDIA.

CERTAIN progressive steps are recorded in the annual report for 1920 of the Women's Medical Service for India (W.M.S.I.), incorporated in the report of the National Association for Supplying Female Medical Aid to the Women of India.[1] A deputation from 16 members of the Service, received by its President Lady Chelmsford in February, 1920, urged, in the interests of the Service, especially with regard to pay and status, that it should be taken over by the Government of India. Lady Chelmsford replied that though the proposal for a Government service was not at present practicable, the question of increased pay[2] was already under consideration and the desire for a more definite status would be met if possible. The Viceroy was officially approached by the Council in the following September with a view to obtaining for officers of the W.M.S.I. a place in the Warrant of Precedence in India, and meanwhile local governments were asked to accord to officers of the W.M.S.I. gazetted rank and to issue orders that they be treated on all occasions with the consideration paid to gazetted officers. This last request shows that the lack of official recognition in a country where precedence counts for so much has been felt, and for the dignity of the service it is to be hoped that the response of the Viceroy has been favourable. The United Provinces, alone of the Provinces, had replied when the report was issued and their answer was immediately to bestow gazetted rank on all officers of the W.M.S.I. Meanwhile, the service has altered its internal nomenclature more in accordance with the traditions of a government service, doubtless in hopeful anticipation of a change in the official attitude. Dr. M. I. Balfour, one of the joint secretaries of the service, is now its chief medical officer. The assistants to the surgeons-general or inspectors-general are now to be known as senior medical officers, and those engaged in hospital duties are graded as executive medical officers of the first, second, third, and fourth grades. The bestowal of certain executive powers on the chief medical officer is under consideration.

## ROYAL NAVAL MEDICAL SERVICE.

Surg. Comdrs.—G. D. Walsh to *Defiance*; C. H. Dawe to *President*, addl., for four months' hospital course; and F. H. Holl to *Renown*. Surg. Lieut.-Comdrs. C. F. O. Sankey to *Harebell*; and W. F. Beattie to *Ceres*. Surg. Lieut. J. F. Haynes to *Woodlark*.

[1] Calcutta: Superintendent Government Printing, India. 1921.
[2] The scale of pay recorded in our Students' Number (August 27th) is the recently revised scale.

## ROYAL ARMY MEDICAL CORPS.

Temp. Maj. J. J. Abraham relinquishes the actg. rank of Lieut.-Col.

Capt. J. A. W. Ebden, from Res. of Off., R.A.M.C., to be Capt.

Lieuts. (temp. Capts.) to be Capts: W. O. Holst, D. F. Panton, L. C. Goument, C. P. Chambers, and G. E. MacAlevey.

### TERRITORIAL FORCE.

Maj. G. R. Livingston, having attained the age limit, is retired, and retains the rank of Maj., with permission to wear the prescribed uniform.

Maj. F. Gracie resigns his commn. and retains the rank of Maj., with permission to wear the prescribed uniform.

The following resign their commns. and retain their rank: Maj. W. J. Mackinnon and Capts. E. N. Thomson, W. Cullen, D. Campbell, and E. McM. Dunlop.

## INDIA AND THE INDIAN MEDICAL SERVICE.

The King has approved the retirement of Lieut.-Col. F. J. Dewes.

Lieut.-Col. J. C. H. Leicester, professor, Medical College, Calcutta, has been granted leave. Maj. F. W. Cragg officiates as Director, Central Research Institute. Maj. D. Heron has been posted as Agency Surgeon at Meshed and Assistant to H.M. Consul General and Agent to the Government of India in Khorasan. Lieut.-Col. G. Fowler, on return from leave, is re-posted to Akola District. Maj. J. Taylor, officiating sanitary commissioner, has been placed under the direct orders of the Government of India. Lieut.-Col. J. B. Christian has been posted as Second Physician, J. J. Hospital, Bombay. Lieut.-Col. S. H. Burnett has been posted as Surgeon Superintendent, St. George's Hospital, Bombay. On return from leave Lieut.-Col. H. A. F. Knapton has resumed the duties of Superintendent of Matheran and Presidency Surgeon, First District, Bombay. Maj. M. A. Rahman has been posted to the United Provinces. Maj. D. Coutts has been appointed to collateral charge of duties of Civil Surgeon and Lecturer on Midwifery and Medical Jurisprudence, Medical School, Amritsar. Lieut.-Col. C. B. McConaghy, on return from leave, has been posted as Agency Surgeon, Bhopal. Maj. J. R. J. Tyrrell, on return from leave, has been posted as Agency Surgeon, Bundel Rund. Maj. F. E. Wilson, on reversion from military duty, has been posted as Residency Surgeon and Chief Medical Officer, Baluchistan. Maj. H. H. Thorburn, who has been officiating in the last-named appointment, will, on relief, take over the Civil Surgeoncy, Quetta, vice Capt. J. B. Hance, who will be posted as Consular Surgeon, Mohammerah.

## MESOPOTAMIA HONOURS.

The King has made the following appointments for services during the operations in Mesopotamia.

*The Most Excellent Order of the Indian Empire.*—To be additional Companions: Col. A. H. Morris, Lieut.-Cols. A. E. Berry and M. MacKelvie, Maj. (actg. Lieut.-Col.) H. W. Illius.

*The Most Excellent Order of the British Empire.*—To be Officers of the Military Division: Maj. A. S. Arthur, Capt. and Bt. Maj. A. MacD. Dick, Capt. W. A. M. Jack.

## MENTIONED IN DESPATCHES.

*Royal Army Medical Corps.*—Lieut.-Col. G. J. Houghton; Lieut.-Cols. and Bt. Cols. T. C. Mackenzie, H. H. Norman; Maj. A. S. Arthur; Capt. (actg. Maj.) C. M. Gozney (killed); Capts. H. C. Godding, A. N. Minns, and C. H. K. Smith.

*Indian Medical Service.*—Lieut.-Cols. A. E. Berry, M. Mackelvie; Maj. and Bt. Lieut.-Col. (Temp. Col.) W. H. Hamilton; Maj. (actg. Lieut.-Col.) H. W. Illius; Majs. J. W. H. Babington and A. A. C. McNeill; Capt. and Bt. Maj. A. MacD. Dick; Capts. E. Cotter, W. A. M. Jack, and J. W. Pigeon (killed in action).

*Indian Medical Department.*—2nd Cl. Asst. Surg. H. E. Gillson; 4th Cl. Asst. Surg. H. C. Halge; Sub-Asst. Surg. (Civil) Kesar Singh; 1st Cl. Sub-Asst. Surg. Waman Hari Supekar; Maula Bux.

## THE R.A.M.C. ROLL OF HONOUR.

The official list of the names of officers of the R.A.M.C. who laid down their lives in the Great War was published in March last and an analysis of the 709 names, according to rank, was given in our issue of March 12th. A roll of honour has now been published by H.M. Stationery Office, price 5*s.*, containing the names of non-commissioned officers and men. There are over 5500 names of the Regular Army and Territorial Force arranged alphabetically, and the document forms part 79 of "Soldiers who Died in the Great War, 1914–1919."

# Medical News.

UNIVERSITY OF LONDON.—The following awards of medical entrance scholarships and exhibitions have been made by the London Inter-Collegiate Scholarships Board:—

*University College.*—Bucknill Scholarship.—A. S. Wesson, Merchant Taylors' School. Additional Bucknill Scholarship.—M. Barer, King Edward's Sch., Birmingham. Medical Exhibition.—Violet H. Comber, Univ. Coll.

*Westminster Hospital Medical School.*—Natural Science Scholarship.—G. A. H. Norman, E. Lond. Coll.

*London (Royal Free Hospital) School of Medicine for Women.*—St. Dunstan's Medical Exhibition.—Muriel F. Prout, Sydenham Secondary Sch. Mrs. George M. Smith Scholarship.—Winifred A. Ladds, Bromley High Sch. Isabel Thorne Scholarship.—Evelyn M. Pakeman, St. Paul's Girls' Sch. Mabel Sharman Crawford Scholarship.—Grace Nicolle, Lond. Sch. of Med. for Women.

*London Hospital Medical College.*—Price Scholarship in Science.—F. W. Ta'Bois, E. Lond. Coll. Science Scholarship.—H. Evans, E. Lond. Coll.

ROYAL COLLEGE OF PHYSICIANS OF LONDON.—The Mitchell Lecture will be delivered by Dr. F. Parkes Weber on Tuesday, Nov. 1st, at 5 P.M., on the Relations of Tuberculosis to General Conditions of the Body and Diseases other than Tuberculosis. On Nov. 3rd, at 5 P.M., Dr. Michael Grabham will give the Bradshaw Lecture on Sub-Tropical Esculents. Dr. R. O. Moon will give the Fitz-Patrick Lectures on Nov. 8th and 10th, at 5 P.M., his subject being Hippocrates in Relation to the Philosophy of his Time.

WEST LONDON MEDICO-CHIRURGICAL SOCIETY.—The opening meeting of the fortieth session of this society will take place at the West London Hospital on Friday, Oct. 7th, at 8.30 P.M., when Sir G. Lenthal Cheatle will give his presidential address on a Study of Breast Cancer in Relation to the Cancer Problem.

LONDON (R.F.H.) SCHOOL OF MEDICINE FOR WOMEN.—The introductory address on the occasion of the opening of the winter session on Oct. 3rd will be given at 3 P.M. by Dr. Louisa Martindale on the Woman Doctor and her Future.

ST. MARY'S HOSPITAL: PAST AND PRESENT STUDENTS' DINNER.—Dr. E. G. Graham Little will preside at this dinner, which will be held at the Connaught Rooms, Great Queen-street, at 7 for 7.30 P.M., on Monday, Oct. 3rd. Applications for tickets (12*s.* 6*d.*, exclusive of wine) should be addressed to Dr. A. Hope Gosse, the Hon. Sec., 15, Queen Anne-street, London, W. 1.

MIDDLESEX HOSPITAL MEDICAL SCHOOL.—The opening of the winter session will be held at the Scala Theatre on Tuesday, Oct. 4th, at 3 P.M. Mr. Gordon Taylor will deliver the introductory address and Sir John Bland-Sutton will distribute the prizes. The annual dinner will be held on the same date at 7.30 P.M. at the Trocadero Restaurant, Piccadilly Circus, London, W.

ST. THOMAS'S HOSPITAL: OLD STUDENTS' DINNER.—Dr. H. W. G. Mackenzie will take the chair at this dinner, which will be held at the Wharncliffe Rooms, Hotel Great Central, London, N.W., on Friday, Oct. 28th, at 7 for 7.30 P.M. The price of the dinner, inclusive, is 17*s.* 6*d.*, to be paid at the Wharncliffe Rooms. Applications for seats should be sent as soon as possible to the Hon. Secretaries, Dr. H. B. Russell and Mr. L. N. Reece, at St. Thomas's Hospital, S.E. 1.

CHARING CROSS HOSPITAL MEDICAL SCHOOL.—The annual distribution of prizes will take place in the out-patients' hall of the hospital on Wednesday, Oct. 5th, at 3.30 P.M. The distributor will be Sir Frederick Mott, F.R.S., and the chairman Sir Herbert Waterhouse.

The annual dinner of past and present students will be held on the evening of the same day at the Adelaide Gallery, Gatti's Restaurant at 7 for 7.30 P.M. The chairman will be Sir James Galloway, and the guest of the evening Sir Frederick Mott. Tickets 12*s.* 6*d.* each may be obtained from the Dean or may be paid for at the door.

POPULAR LECTURES ON PSYCHOLOGY.—Among the courses of public lectures to be delivered at King's College, Strand, W.C., during the forthcoming Michaelmas term is one on Psychology and Psycho-Therapy by Dr. William Brown, Wilde Reader on Mental Philosophy at the University of Oxford. The course will consist of ten lectures, the first of which will be given on Oct. 18th at 5.30 P.M., and the remainder on successive Tuesdays.

NATIONAL HOSPITAL FOR DISEASES OF THE HEART: POST-GRADUATE COURSE.—A special course of ten systematic lectures will begin on Monday, Oct. 10th, at 5.30 P.M., when Dr. J. Parkinson will lecture on Aortic Disease. Subsequent lectures, to be given by Sir S. Russell-Wells, Dr. P. Hamill, Dr. F. W. Price, Dr. J. S. Goodall, Dr. R. O. Moon, and Dr. B. T. Parsons-Smith, will be announced in our Medical Diary. Clinical demonstrations are given, and the clinical practice of the hospital is open to post-graduate members of the course. A fee of £2 2*s*. per month, or £5 5*s*. for three months, is charged. Appointments as clinical assistants are also open to members of the course. All inquiries should be addressed to the Dean, Dr. P. Hamill, and cheques made payable to the Secretary of the Hospital at Westmoreland-street, W. 1.

SOME PROBLEMS OF MODERN BIOLOGY.—A course of 24 lectures under this general title will be given at Gresham College, Basinghall-street, London, E.C., on Mondays, at 6 P.M., beginning Oct. 3rd, by Mr. William B. Brierley, D.Sc. The aim of the lectures, which are being given as a university extension course, is to make a survey in the light of recent experimental research of some of the main problems and tendencies in biology and to attempt to build up a coherent system. The lectures are divided into four groups under the headings: (*a*) Problems of Life, Growth, and Death; (*b*) Problems of Sex and Inheritance; (*c*) Problems of Interpretation; and (*d*) Problems of Practice. The fee for the session of 24 lectures is 17*s*. 6*d*., or 10*s*. for the term of 12. Admission to the first lecture on the Origin of Life is free and to each subsequent single lecture 1*s*. 6*d*. Further particulars as to this and other university extension courses may be obtained from Mr. J. Lea, University Extension Registrar, University of London, S. Kensington.

ROYAL INSTITUTE OF PUBLIC HEALTH.—A course of eight lectures and discussions on Problems of Public Health in Relation to Industrial Hygiene will be delivered in the lecture theatre of the Institute, 37, Russell-square, London, W.C., on Wednesdays, at 4 P.M., starting on Oct. 19th. The first lecture will be delivered by Sir Thomas Oliver on Problems of Industrial Hygiene in Relation to Public Health, Lord Askwith presiding. Subsequent lectures, which will be announced in our medical diary, will be given by Dr. R. M. Wilson, Dr. H. M. Vernon, Prof. Louise McIlroy, Prof. S. Lyle Cummins, Dr. R. Prosser White, Prof. Edgar L. Collis, and Sir Kenneth Goadby. A discussion will follow each lecture. Medical officers of health, medical practitioners, sanitarians, medical students, and all men and women engaged in any form of public health service or interested in medico-sociological problems are invited to attend. Further particulars may be obtained on application to the Secretary, The Royal Institute of Public Health, 37, Russell-square, London, W.C. 1.

BETHLEM ROYAL HOSPITAL.—A course of lectures and practical instruction for the Diploma in Psychological Medicine granted by the various universities has been arranged to commence on Monday, Oct. 10th. The course is divided into two parts. Part A comprises the anatomy, histology, and physiology of the nervous system, together with psychology (general, experimental, and of dreams). Part B comprises neurology, psychological medicine, and mental deficiency. Lectures will be delivered by Sir Maurice Craig, Drs. S. A. Kinnier Wilson, C. Worster-Drought, F. C. E. Danvers-Atkinson, Clement Lovell, William Brown, W. H. Rivers Rivers, E. D. Macnamara, W. H. B. Stoddart, R. Hunter Steen, J. G. Porter Phillips, Thomas Beaton, H. E. Wingfield, and A. R. Tredgold. The course will take place according to a time-table which may be obtained on application to the Physician Superintendent, Bethlem Hospital, S.E. 1. Fee for the full course £15 15*s*.; for either part separately, £10 10*s*.

NORFOLK AND NORWICH HOSPITAL.—The last quarterly report of this hospital forms a welcome contrast to the almost universal depression in the financial state of our voluntary hospitals. The board of governors reports that the increased financial support referred to in their last report has been continued, and that the expenditure for the first six months of this year has been covered by the income received in that time. This is a gratifying improvement on the condition of affairs prevailing last year, when the expenditure exceeded the income by £250 a week, as a result of which it was found necessary to close one of the wards. This improvement in the finances of the hospital is due, in the first place, to the result of the entertainments organised throughout the county on behalf of the hospital, which brought in the substantial sum of £6000 in six months; and secondly, to the growth of the contributory scheme in connexion with the Sunday and Saturday Fund, from which the institution received £3200 as a first instalment for this year. It has been decided to reopen the ward which had been temporarily closed, but the board urges subscribers to continue their efforts, and reminds them that there is still an overdraft of £28,000 due to the bank. The quarterly report of the work done by the hospital shows that the in-patients numbered 711, against 833 in the corresponding quarter of 1920; the daily average of in-patients was 234, against 263 last year. This diminution in numbers was no doubt due to the closing of a large ward; but, on the other hand, the number of operations was 521, compared with 491 last year. The new cases treated in the out-patient department were 827, and the accidents and casualties 1829, these figures last year having been 506 and 1862.

LONDON TELEPHONE EXCHANGE TRANSFERS.—From Paddington 3385 to Langham 2539, F. W. Price. From Mayfair 3677 to Grosvenor 1408, W. E. Robinson.

AMERICAN UROLOGICAL ASSOCIATION.—At the last annual meeting held at Montreal, Canada, in June, this Association decided to discontinue publication of the yearly transactions. Papers which have heretofore appeared in the transactions will be published in the *Journal of Urology* (Williams and Wilkins, Baltimore), which is now the official organ of the Association.

FOREIGN DECORATIONS.—The King has granted permission to wear the undermentioned decorations, which have been conferred in recognition of valuable services rendered:—The Order of the Nile, Second Class (Egypt), to Dr. Owen William Richards, C.M.G., D.S.O., Director, School of Medicine, Cairo; the Order of the Excellent Crop, Sixth Class (China), to Dr. Norman Hay Bolton, Medical Officer, Shanghai-Nanking Railway.

DONATIONS AND BEQUESTS.—The late Miss Hannah Amelia Irving, of Bennett Park, Blackheath, has left by will £3000 to the London Hospital to endow three beds in the Cancer Ward; £2000 to the Middlesex Hospital to endow two beds in the Cancer Ward; £200 each to the Royal London Ophthalmic Hospital, Moorfields, St. Mark's Hospital for Fistula, City-road, the East London Hospital for Children, the Surgical Aid Society, and the Poplar Hospital; £100 each to the Nursing Sisters of St. John The Divine, Bowlane, E., and the Miller General Hospital, Greenwich. The residue of the estate is to be divided between the Royal Hospital for Incurables, Putney, the British Home and Hospital for Incurables, Streatham, and two other beneficiaries.—Under the will of the late Mr. Frank Sammon Parsons, of Shipston-on-Stour, who left estate of the gross value of £24,337, with net personalty £21,282, the testator left £2000 upon trust to pay three incomes to certain benefactors, with remainder to the Moreton-in-the-Marsh Cottage Hospital.

# Appointments

*Successful applicants for vacancies, Secretaries of Public Institutions, and others possessing information suitable for this column, are invited to forward to* THE LANCET *Office, directed to the Sub-Editor, not later than 9 o'clock on the Wednesday morning of each week, such information for gratuitous publication.*

DUNSCOMBE, N. D., B.A., B.Ch. Cantab., L.M.S.S.A. Lond., has been appointed Assistant Medical Officer, Royal Earlswood Institution, Redhill, Surrey.

MACGILLIVRAY, G., M.B., Ch.B. Aberd., Tuberculosis Officer for Fife.

PRINGLE, K. D., M.B., B.C. Cantab., Medical Officer of Health to the Brecknock Rural District Council.

STEVENS, B. C., M.D., M.S. Durh., F.R.C.S. Edin., D.P.H. Oxf., Medical Officer of Health for the County Borough and Port of Grimsby.

# Vacancies.

*For further information refer to the advertisement columns.*

*Aylesford, Kent, Preston Hall Treatment and Training Colony for Tubercular Ex-Service Men.*—Sec. Asst. M.O. £300.

*Belfast District Asylum.*—Two Asst. M.O.'s. £300.

*Benenden, Kent, National Sanatorium.*—Asst. M.O. £250.

*Birkenhead, County Borough of.*—Asst. M.O. £650.

*Birmingham General Hospital.*—Res. M.O. £155. H.S.'s. Each £125.

*Bournemouth, Royal Victoria and West Hants Hospital, Poole-road Branch.*—Res. M.O. £200.

*Brighton, Royal Sussex County Hospital.*—Hon. Surg. Hon. Asst. Surg. Hon. Med. Clin. Asst. Cas. H.S. £140. H.S.'s £140.

*Cardiff, King Edward VII. Hospital and Medical School.*—H.S. £200.

*Chelsea Hospital for Women, Arthur-street, S.W.*—Hon. Dental Surg.

*Clifton, York, North Riding Mental Hospital.*—Sen. Asst. M.O. £400.

*Derby, Derbyshire Royal Infirmary.*—Ophth. H.S. £200.

*Elizabeth Garrett Anderson Hospital, Euston-road.*—Female Asst. S.
*Glasgow Asylum Service.*—Asst. M.O. and Pathologist. £275.
*Glasgow Distric Mental Hospital, Gartloch, Gartcosh.*—Jun. Asst. M.O. £350.
*Hospital for Sick Children, Great Ormond-street, W.C.*—Res. Asst. Cas. O. Res. H.P. Each £50.
*Ilkeston, Borough of.*—M.O.H. £700.
*Leeds Public Dispensary.*—Sen. Res. M.O. £250.
*Macclesfield General Infirmary.*—Asst. H.S. £150.
*Manchester Royal Infirmary.*—Asst. M.O. £35.
*Manchester and Salford Hospital for Skin Diseases.*—Asst. M.O. H.S. £100.
*Northampton General Hospital.*—H.S. £200.
*Norwich, Norfolk and Norwich Hospital.*—H.S. £200.
*Nottingham Education Committee.*—Jun. Asst. Sch. M.O. £500.
*Nottingham General Hospital.*—H.P. £200.
*Oxford, Radcliffe Infirmary and County Hospital.*—H.P. £200.
*Peterborough Infirmary.*—Hon. Phys.
*Plymouth, South Devon and East Cornwall Hospital.*—H.S. £200.
*Prince of Wales's General Hospital, Tottenham, N.*—H.P. H.S. Each £200. Jun. H.S. Jun. H.P. Each £120.
*Queen Mary's Hospital for the East End, Stratford, E.*—Cas. O. £150.
*Queen's Hospital for Children, Hackney-road, Bethnal Green, E.*—Cas. H.S. £100.
*Rotherham Hospital.*—Jun. H.S. £150.
*Royal Chest Hospital, City-road, E.C.*—H.P. £120. Res. M.O. £200.
*Royal National Orthopædic Hospital, 234, Great Portland-street W.*—Clin. Asst. £105.
*Ryde, Royal Isle of Wight County Hospital.*—Res. H.S. £200.
*St. Helens Hospital, Lancs.*—Res. M.O. £250.
*Salford Royal Hospital.*—Res. Surg. O. £250. H.P. £200. H.S. £150. Cas. H.S. £150.
*Sheffield Royal Infirmary.*—H.S. H.S. for Ear, Nose and Throat. Each £150.
*Singapore, Government Medical School.*—Professors of Physiology, Anatomy, Medicine, Midwifery and Gynæcology. £1190. Lecturers in Chemistry and Physics, Biology. £840.
*Stoke-on-Trent, North Staffordshire Infirmary, Hartshill.*—H.S. £200.
*Western Ophthalmic Hospital, Marylebone-road, N.W.*—Non.-res. H.S. £150.
*Weston-super-Mare Hospital.*—H.S. £150.
*Wolverhampton and Staffordshire General Hospital.*—Res. M.O. £200.

The Chief Inspector of Factories, Home Office, S.W., announces the following vacant appointment:—Newton Stewart (Wigtown).

# Births, Marriages, and Deaths.

## BIRTHS.

GRACE.—On Sept. 14th, at Gloucester-crescent, Regent's Park, the wife of W. H. Grace, M.B., M.R.C.P. Lond., of a son.
MORRIS.—On Sept. 18th, the wife of Lionel F. Morris, L.D.S. R.C.S. Eng., of West Moor, Bournemouth, of a daughter.
REICHWALD.—On Sept. 16th, at Timber Hill, Ashtead, the wife of M. B. Reichwald, of a son.

## MARRIAGES.

BAMPTON—PURSLOW.—On the 10th inst., at St. Simon's Church, Southsea, by the Rev. N. E. Ashenden, M.A., Horace Edgar Bampton, L.D.S. R.C.S. Eng., of Four Oaks, to Alice Maud Mary, daughter of Dr. and Mrs. Purslow, of Broad-street, Birmingham, and Southsea.
BROWNE—CARROLL.—On Sept. 15th, at Minehead, Lieut.-Colonel C. G. Browne, C.M.G., D.S.O., R.A.M.C., to Florence (Pat), eldest daughter of Brigadier-General J. W. Carroll, C.M.G., D.S.O. (late Norfolk Regiment.) and Mrs. Carroll, of Boldon, Minehead, Somerset.
FOULKES—VAUGHAN.—On Sept. 17th, at Emmanuel Church, Camberwell, Richard Kenrick Foulkes, M.B., to Mary Gwendolen, only daughter of the Rev. F. D. and Mrs. Vaughan, of Emmanuel Vicarage, Camberwell.

## DEATHS.

BYAM.—On Sept. 12th, at Worthing, from peritonitis, Samuel Henry Byam, L.R.C.P. Lond., M.R.C.S. Eng., of Chester-square, London, S.W., aged 73 years.
FAULDER.—On Sept. 11th, at Glendaruel, Argyllshire, Julia, the beloved wife of Major T. J. Faulder, F.R.C.S., R.A.M.C. (T.A.) and elder daughter of W. Harrison Cripps, Esq., F.R.C.S., of Glendaruel.
MCCREERY.—On Sept. 10th, at Colaba War Hospital, Bombay, Major A. T. J. McCreery, M.C., R.A.M.C., eldest son of the late Colonel B. T. McCreery, R.A.M.C.
ROBERTS.—On Sept. 5th, in Madras, Lieut.-Colonel Edmund Arthur Roberts, D.S.O., I.M.S.
WILLIAMS JONES.—On Sept. 16th, at Prestatyn, North Wales, John Williams Jones, of 2, Albert-road, Whalley Range, Manchester, L.R.C.P. & S. Edin. and L.M. Glasg., in his 68th year.

*N.B.—A fee of 7s. 6d. is charged for the insertion of Notices of Births, Marriages, and Deaths.*

# Notes, Short Comments, and Answers to Correspondents.

## THE PRESENT POSITION OF PSYCHO-THERAPY.

BY MILLAIS CULPIN, M.D. LOND., F.R.C.S. ENG.,
LECTURER ON PSYCHONEUROSES, LONDON HOSPITAL.

AN increased interest in the psychological aspect of medicine is one of the unexpected results of the war. Soon after the outbreak of hostilities officers and men were invalided home in fairly large numbers under the diagnosis of "concussion" or "shell-shock," and presented symptoms which were ascribed to these physical causes. Newspaper stories appeared of marvellous recoveries from mutism, blindness, or paralysis in returned soldiers, and it was finally recognised that the words "concussion" and "shell-shock" (the latter had by then been made an official term) were by no means synonymous, but indicated two groups with causations diametrically opposite, one being physical and the other mental. The physical symptoms of the mental condition were recognised as identical with those described in civil life under the name of hysteria, and, in fact, Hector Gavin[1] had described as early as 1843 practically all the physical disabilities seen in these cases of shell-shock. The assumption that shell-shock had a gross anatomical basis recalls the half-forgotten controversy concerning "railway spine"—a condition regarded as due to gross organic changes till the efforts of H. W. Page and the late Furneaux Jordan established its emotional origin. One regrets that the work of these surgeons was overlooked in the attempt to establish an anatomical pathology of shell-shock; Page's book, "Railway Injuries,"[2] needs only the addition of a chapter on modern psychological theories to make it a complete picture of the war neuroses. The centre of interest gradually shifted from the bodily symptoms known to be dependent upon mental disturbances, and attention was directed more to the mental disturbances themselves. This change coincided with a change in the nature of the cases which, as time passed, presented less of the hysterical symptoms and came more into line with the compulsion and obsessional neuroses, anxiety states, and psychasthenias of civil life. These latter conditions are generally found classified as "neurasthenia"—a term which now has little value for purposes of definition, though there are a few cases to which it may properly be applied.

### *Mental and Physical Causes.*

The physical aspect of the subject is concerned with:—

(*a*) True concussion, often followed by symptoms scarcely to be distinguished from those produced by strong emotion. Careful psychological investigation of individual cases is necessary before the physical and mental factors can be separated, but it is to be noted that the claim of men suffering from shell-shock to have been unconscious for a varying period after the shock rarely rests upon a true insensibility, but upon a loss of memory which can often be restored by psychological means (hypnosis, &c.).

(*b*) The effect of vibration upon the molecular structure of the brain. Carver and Dinsley[3] produce evidence to show that the vibrations produced by a certain sequence of explosions cause psychical effects, which suggests that, just as explosives may be discharged by other explosions at a distance, so the cells of the central nervous system may react to particular vibrations.

(*c*) Toxins, whether their action is direct, upon the nerve centres, or indirect, by lowering the sense of well-being.

(*d*) The functions of the endocrine glands, which are closely associated with emotion. Here is to be sought the explanation of those cases diagnosed in the army as disordered action of the heart, or effort syndrome, which are now claimed as their own by both cardiologists and neurologists.[4] Nervous symptoms commonly occur with the cardiac disability, and in addition there are found excessive sweating, cyanosis of the hands, fine tremors, easy induction of nervous and muscular fatigue, and other symptoms dependent upon interference with the sympathetic nervous system and the ductless glands.

The conception of a physical causation for hysteria had long been abandoned, though physical means are still commonly used in its treatment. With regard to other nervous conditions, opinion was less definite; the cause of

[1] Gavin, Hector: Feigned and Fictitious Diseases in Soldiers and Sailors. London. 1843.
[2] Page, H. W.: Railway Injuries. London: C. Griffin. 1891.
[3] Carver, A., and Dinsley, A.: Some Biological Effects due to High Explosives, Brain, 1919, vol. xlii., p. 113.
[4] THE LANCET, 1920, ii., 184.

the symptoms vaguely described as neurasthenia was practically unexplained, though physical causes such as toxæmia were sometimes postulated. The view is still widely held that the physical condition is the primary cause when such troubles as constipation or enteroptosis are found associated with neurasthenia: similarly, in regard to the condition already alluded to as disordered action of the heart, it is often assumed that the nervous symptoms are secondary to the cardiac trouble. Those who approach nervous disorders from the psychological side do not ignore the action of toxins or exhaustion upon nerve centres—observation of febrile diseases would prevent such a mistake—but they find that mental causes underlie the diseases variously described as hysteria, anxiety states, compulsion or obsessional neuroses, psychasthenia, and neurasthenia. These are the conditions generally called nervous, and it is obvious that this use of the word, though sanctioned by custom, is incorrect; "nervous" diseases are mental. It is partly for this reason that "psychoneurosis" is often used in place of the older "neurosis." The link between bodily symptoms and mental states is probably to be found in the sympathetic nervous system and the ductless glands. Cannon[5] has shown how emotion affects the glandular secretions, and glandular secretions in turn have great influence upon bodily and mental functions. Although changes in the brain substance—in general paresis of the insane, for example—produce alteration in function, yet it does not follow that alterations in function must always be associated with demonstrable changes in structure. The fact that the symptoms of the psychoneuroses are amenable to psychotherapy does not lead us to expect to find their prime cause by the study of morbid anatomy.

With regard to insanity, the need for distinction between organic and mental causation is equally obvious. Different views concerning the pathology of that form known as dementia præcox illustrate a present conflict of opinion. To some authorities it is a disease of the brain, with added pathological changes in other structures—for example, the genital glands; on the other hand, it is regarded by some—e.g., by Jung—as a psycho-genetic disease with possibilities of treatment by psychological means, though the question is left open as to whether the mental cause may produce toxins that ultimately affect structure. The varieties of insanity which are believed to rest upon a psychological basis are manic-depressive insanity, dementia præcox, and paranoia. The importance of recognising their mental origin lies in the fact that in early stages the patients may be accessible to treatment. The inaccessibility to treatment shown by the insane, and their failure to recognise their infirmity, distinguish the psychoses from the psychoneuroses.

*The Psychological Theory.*

The outbreak of war came at a time when a new theory of the cause of mental disorders had attracted attention, and had been adopted by a few workers in this country. This theory was promulgated in 1895 by Freud, of Vienna, who found that hysterical symptoms were related to past incidents in the life of the patient which had been forgotten or repressed into a part of the mind which he calls the "unconscious." Being buried in the unconscious the memory does not lie dormant, but sends into the consciousness certain impulses which create the hysterical symptoms. By a process which he calls psycho-analysis the memories were brought to consciousness and the symptoms disappeared.

The theory soon became more elaborate; the buried memories proved to be connected with repressions concerning sex and those repressions went back to infancy, during which the sex instinct undergoes a course of evolution liable to arrest at any stage. Freud traces the sex instinct through a period of attachment to the self, then of attachment to the parent—usually the parent of opposite sex—till it finally reaches that stage of attachment or attraction to the opposite sex which we have hitherto regarded as the sum of normal sexuality. The instinct may be arrested at any of those stages, the memory of which is rarely or never within the consciousness of the adult, and the person concerned is at a disadvantage throughout life owing to this unconscious fixation upon a parent or upon a still more primitive sexual object. According to this theory, conflict and repression—one factor in the conflict being repressed by opposition of other interests or desires—produce the mental symptoms, and cure is sought by reviving memories excluded from consciousness, and by teaching the patient to face his troubles; when properly approached, the latter are often of little importance. The technique of this revival need not concern us, but making the patient work out the interpretation of his own dreams is an essential part of it.

This very brief summary of the "theory of the unconscious" at first sight bears little relation to war cases, but investigation of these has produced confirmation of at least a part of the theory. It had been freely assumed that a man who has passed through terrifying experiences should endeavour to forget them, and this assumption at first largely guided the treatment of war psychoneuroses. But it was soon found that any attempt to make a patient talk of his war experiences met at once with a definite refusal or some other form of resistance. When the man was persuaded to talk a difficulty in recall became obvious, and investigation by means of psychological technique revealed that even when the man had told all he knew there still remained in the majority of cases a loss of memory for strongly emotional incidents. Moreover, a total loss of memory for the war or even for the man's previous life was a well-known symptom in severe cases of shell-shock. Hence it followed that "forgetting," so far from being a necessary object of treatment, was already associated with the diseased state, and even formed part of it. When the memories were revived they were often proved to have found symbolic expression in the symptoms; stammers and tremors were obvious symbols of the terror attached to the repressed memory, and disappeared with its revival. Even the bizarre gasps, sniffs and grimaces occurring with the stammer represented definite repressions; disgust at horrible smells, the putting on of a gas mask, efforts to free the head when partly buried, have found symbolic representations in an individual stammerer, and difficulty with certain initials has referred to forgotten names with emotional significance. Hysterical gaits, dyspnœa, unreasonable fears and obsessions, nightmares, fits, and somnambulisms, as well as many unclassifiable symptoms, were similarly traced back to forgotten incidents and removed by their revival.[6]

These observations confirm the existence and influence of repression, and further consideration shows the repression to have resulted from conflict. Perhaps the conflict was between desire to avoid danger and discomfort, on the one side, and duty or sensibility to public opinion on the other. The desire became repressed into the unconscious but found expression in the symptom, the patient being unaware that the symptom was really a means of escape from the conflict. Conflict of this nature, in which a material end is sought unconsciously, is not so common as one might expect. More often the repugnant memory of the horrors of modern war was thrust down into the unconscious and later found expression in a psychoneurosis. Only a proportion of the cases showed an ætiology so completely related to war experience. Many soldiers broke down from mental strain before reaching the front line; there was a varying degree of resistance, so that some men succumbed at the thought of being called up, others broke down during training, at disembarkation in an enemy country, or at the first experience of shell-fire, and others only after years of strenuous fighting.

Resistance against breakdown obviously varied with the man's mental constitution, and an early breakdown was practically always correlated with a lowered resistance to the ordinary troubles of civil life, as shown by a history of previous nervous symptoms or illnesses. This was illustrated by a series of 397 neurological cases[6] which were divided into two groups—one of 150 men presenting a history of nervous predisposition or symptoms, and one of 247 men in whom investigation failed to find evidence of predisposition. The men of the first group had served abroad for an average of nine months, those of the second for an average of 19 months. It followed that the study of war cases could not be separated from the study of cases arising in civil life, and in these were found conflicts and repressions derived from causes apart from warfare, similar to those found in the simple war cases. This view of the processes concerned in the psychoneuroses may be regarded as definitely established, and it is accepted in the writings of William Brown, William McDougall, C. S. Myers, T. H. Pear, W. H. R. Rivers, R. G. Rows, G. Elliot Smith, and others.

At this point opinions diverge; psycho-analysts, whilst claiming that the predispositions revealed in so many cases are based upon infantile repressions, admit that patients are greatly benefited by revival of the more superficial unconscious material, but psycho-analysis in the proper sense of the word is so prolonged and difficult a task that one may safely say very few war cases have been fully studied by the psycho-analytical method. The names of individual workers quoted above probably represent as many degrees of acceptance of the theory of psycho-analysis, but the facts of repression and conflict must be regarded as established by war experience; this is a definite step forward in the understanding of mental diseases.

Persuasion, re-education, and suggestion still play their part in treatment, but it cannot be claimed that they are based upon such firm psycho-pathological grounds as are the various methods of mental exploration.

[5] Cannon, W. B.: Bodily Changes in Pain, &c. London: Appleton. 1915.

[6] Culpin, Millais: Psychoneuroses of War and Peace. Camb. Univ. Press. 1920.

*Present Conditions.*

This survey of the trend of opinion indicates that at the outbreak of war we were little prepared to deal on a large scale with casualties that needed treatment by the methods discussed above; the large number of neurological cases occurring in the army called for action, and neurological centres were established both at home and in the war areas. But functional nervous disorders had hitherto been neglected in the training of the medical student, and clinics for their treatment were practically unknown. The need for training medical men was faced, and during the war centres were established at Maghull and Seale Hayne, to which were sent R.A.M.C. officers and others for a course of training in the subject. Even now the supply of practitioners able to understand and treat cases among pensioners is so insufficient that the Ministry of Pensions offers a course of training at Tooting under the direction of Dr. R. G. Rows, formerly in charge of the Maghull centre. The care or treatment of the insane soldier was separated from that of the psychoneurotic, though difficulties of diagnosis caused occasional errors. The strangeness and severity of some psychoneurotic conditions led to diagnoses of insanity which were ultimately revised, and, on the other hand, a small proportion of the inmates of neurological hospitals became certifiable. The authorities met this difficulty when they established hospitals under expert psychiatrists, where soldiers were kept under observation for a period of not less than nine months before being certified as insane. The needs of pensioners are now being met by the establishment of out-patient clinics, hospitals, and training centres all over the country. The Maudsley Hospital, the fate of which is just now in the balance, is an example of institutions where "border-line" cases are taken for investigation. It must be admitted that these efforts are hampered by the facts that pensioners need much urging before they will accept treatment, and that in mental cases neither the patients nor their friends are always the best judges as to what treatment is necessary. The "neurasthenic" pensioner is a special problem,[7] for his neurotic symptoms serve as a flight from hard reality, and in present economic conditions he is at a considerable disadvantage in the labour market, so that his adjustment to reality often becomes impossible. This condition is not to be taken as indicating a deliberate malingering, or retention of symptoms for a conscious end; the influence of financial and domestic worry cannot be denied in cases occurring in private practice where no question of pension arises.

The experience gained during the war, and especially the recognition that many—probably at least half—of the war patients had suffered from nervous manifestations before enlistment, helped to draw attention to the needs of the civil population. The sufferer from a bodily hysterical disability had hitherto been regarded with a certain degree of contumely, as being responsible for a condition which he or she ought to overcome by a little common-sense. Presumed organic disorders cured by pious pilgrimages, bone-setters, Christian Science and similar means, were explained as hysterical, and our professional responsibility ceased with the making of the diagnosis. But if hysteria is curable it should be our duty to cure it, and if others succeed when we have failed we must be honest enough to confess our failure. The war has taught that even the hysteric may desire to be cured, and the sufferers from other psychoneuroses bear them in silence only because they have come to regard their condition as beyond our help. Hitherto the student has felt that the subject is unimportant, that treatment is directed by no intelligible principles, and that the sufferers themselves are mere nuisances and may properly be left to their troubles; but the attention given to functional nervous disorders during and after the war, and the diffusion of knowledge concerning them, should make itself felt in medical education, especially when the ever-widening field of psycho-therapy is recognised. That such diverse conditions as asthma, writer's cramp, and stammering should be placed among the functional nervous disorders now found amenable to treatment by mental exploration is an indication of the practical value of that treatment.

The study and treatment of psycho-neuroses and of cases on the border-line of insanity are inseparable; neglect of one is associated with neglect of the other, and in the past our students have derived their knowledge of psychiatry from a few visits to an asylum where they saw advanced certified cases of mental disease. In practice medical men are faced with early or doubtful cases in which, under present conditions, little or nothing can be done until the patient is certifiably insane, unless his position is such that he can afford the luxury of a private institution for an indefinite period. The city of Birmingham has shown a good example by the establishment of a "nerve hospital," containing 35 beds, and situated in grounds of several acres. Here are admitted cases of functional nervous disorders requiring in-patient treatment, and amongst these will come the "border-line" sufferers who would otherwise remain untreated until they became fit for an asylum. An out-patient department is worked in conjunction, and the treatment is along the lines indicated by modern psychology. Special out-patient clinics have been established at some of our large hospitals, but there is a general lack of such provision as Birmingham provides for treating the potentially insane when he is still accessible to treatment.

A description of clinics and hospitals on the Continent, where non-certifiable cases are received without the stigma attached to asylum treatment, is given in the work on shell-shock by Elliot Smith and T. H. Pear.[8] This book, in spite of its title, is a plea for the early treatment of the uncertifiable cases of civil life, and in it emphasis is laid upon the observation that the hereditary nature of mental disorders is probably over-rated; just as tuberculosis is now known to be often conveyed from parent to offspring by infection and not by heredity, so the evil home influence inseparable from the presence of neurotic or drunken parents is bound to produce effects upon the mental stability of their children quite apart from or in addition to the effects of hereditary predisposition. H. Crichton Miller[9] shows this in the study of 28 army cases, where he traced failure of mental adaptation in adult life to the influence of a drunken or cruel father with a resulting fixation upon the mother; he admits the hereditary element, but the developmental flaw is far more apparent. The psychological investigation of juvenile delinquents offers a promising field with prospects of ameliorating or curing criminal tendencies. Sentimentality has no place in this question—if a child or young adult can be saved from a bad career only by a term of imprisonment then the imprisonment is justified; but such punishment obviously fails in many cases. Committal to a reformatory, or supervision by a court official or missionary, is an effort in the right direction, but more is needed. A child who repeatedly offends in a particular way, who derives no obvious benefit or pleasure from the offence, and on whom punishment has no deterrent effect, is urged by a motive hidden from the casual observer. The offenders are not carrying out conscious wishes, for they are urged by some impulse which they cannot resist or understand; they may even be keenly sensitive to their disgrace and long to be cured of the impulse. Kleptomania as a plea in defence has become a by-word, but there certainly are cases where the impulse to steal is psychologically on all fours with a psychoneurotic obsession, and, like it, is a fit matter for investigation and treatment.

William Healy, Director of the Psychopathic Institute of the Juvenile Court, Chicago, has shown[10] the application of the theory of the unconscious to these cases. Stealing, vagrancy, truancy, and other examples of misbehaviour were investigated by him and his colleagues, and by the use of methods which he admits were often superficial it was found that of 2000 cases over 7 per cent. presented examples of mental conflict, generally sexual in origin, as a main cause of the delinquency. Let us bear in mind that the trouble arose from a struggle against something which the child believed was evil—that the evil thought, thrust into the unconscious, yet possessed such dynamic energy that it manifested itself in the pathological impulse to offend. In these cases the correct treatment is by mental exploration; the use of restraint or punishment only increases the conflict and creates an anti-social grievance in the mind of the sufferer. In our country we have very little experience of this particular application of psycho-therapy; but it is plain that the elucidation of the mental processes concerned cannot be undertaken by those untrained in methods of mental exploration, which is something more than mere questioning of the patient.

*General Survey of Opinion.*

Healy shows how the new methods are finding application in America. In Austria and Germany the adherents of Freud are very active, and meet with great opposition; an energetic controversy concerning the mental or physical cause of the war neuroses seems to have ended in a victory for the advocates of the former. A centre of clinical research and literary activity is the Psychiatric Clinic of the University of Zurich, where Jung and his colleagues, departing from the absolute sexual theory of Freud, have built up a psycho-analytical philosophy based upon unconscious strivings not necessarily of a sexual nature. The principles of Jung have a fair number of adherents in this country. In France the influence of Babinski and Bernheim is still powerful; suggestion is regarded as the cause

[7] Culpin, Millais: The Problem of the Neurasthenic Pensioner. Brit. Jour. Psychol. (Medical Section), 1921, Parts 2 and 3, p. 316.

[8] Smith, G. Elliot, and Pear, T. H.: Shell-shock. Manchester Univ. Press. 1917.

[9] Functional Nerve Disease. Oxford Med. Publications, 1920

[10] Mental Conflict and Misconduct. London, Kegan Paul, 1919.

of hysteria, and the chief agent in its removal, though the methods of persuasion and explanation—perhaps owing their success to an element of suggestion—find their advocates. Janet remains an uncompromising opponent of the theories of Freud, though his own valuable work on dissociation as an explanation of certain mental phenomena was their direct precursor.

Taking a general view of recent development, we find a great increase of interest in the mental processes underlying certain disorders. The full theory of psycho-analysis, regarded by its supporters as an almost revolutionary conception of human thought-processes, is far from being generally accepted; but the investigation of the clinical material so abundant as one of the results of war has led to the establishment of many of its principles. The application of these principles to the study and treatment of psycho-neuroses, psychoses, and some varieties of criminality is already demonstrated to be of great practical utility.

## PUBLIC HEALTH IN BIHAR AND ORISSA, 1919.

THE statistics of births and deaths in this province for the year 1919 are calculated on the census population of 1911—namely, 34,489,846. On this basis the birth ratio was 30·4 per 1000, as compared with 37·5 in 1918, and 39·5 in the quinquennium 1914–18; and the death ratio 40·0, as compared with 56·7 and 37·0. This low birth ratio was due to high prices of food, the epidemic of influenza, and the absence of a large number of both sexes recruited for the tea districts. The birth-rate varied from 22·6 in Manbhum district, and 22·8 in the Santal Parganas, to 35·7 in Gaya, and 36·2 in Palamau. In this district the birth-rate was exactly the same as the death-rate. In Patna the birth ratio (31·7) was 0·6 above that from deaths. In every other district throughout the province the mortality ratio exceeded that for births. The highest mortality recorded in any district was that of 87·9 per 1000 in Angul, and the next highest that of Puri (70·3) on the sea coast. Both these districts are in Orissa. On the other hand, Darbhanga (in Tirhut) lost only 30·5, Singhbhum (in Chota Nagpur) 31·1, and Patna also 31·1 per 1000; the respective ratios for the preceding quinquennium having been 38·0, 26·7, and 42·0. Taking the province as a whole the highest mortality was recorded in January, due to a continuance of the influenza epidemic of the preceding year. The infantile mortality ratio (214·5 per 1000 births) was less than that of 1918 (231·2). It varied from 119·6 in Darbhanga to 607·6 in Angul. Lantern lectures on child welfare and maternity work were given in some of the large towns, and articles on the subject published in the local newspapers. As regards mortality among different classes of the population the ratio for Hindus (who form about four-fifths of the total) was 40·9, for Mohammedans 31·5, and for Christians 24·3 per 1000.

### *Fevers: Influenza, Cholera, Plague.*

The rise in general mortality (40·0 per 1000) as compared with the preceding quinquennium (37·0) was recorded chiefly under the heading of "Fevers" (28·1 compared with 24·4), and was due to influenza. 970,655 deaths out of the total 1,379,657 were registered under "Fevers." In the district of Angul (in Orissa) the "fever" mortality was 63·1 per 1000, as compared with 26·6 in the quinquennium. In Saran and Patna the ratios were only 17·3 and 17·6 respectively. Dr. S. N. Tiwari, D.P.H., officiating sanitary commissioner, who presents this report,[1] remarks that "only 10,765 deaths were reported from influenza throughout the whole province. This is obviously wrong. . . . The presumption is that the high mortality returned under fevers, in the first few months of the year, was due to the declining epidemic of influenza of 1918, which continued in 1919." Anti-malarial operations and free distribution of quinine were continued. Cholera caused 104,727 deaths (3·0 per 1000, the same as in the quinquennium, 1914–18). It was epidemic in the Orissa division, where the deaths numbered 42,217 (8·2 per 1000), and particularly in the district of Puri (12·8 per 1000). This province has an especial importance in regard to cholera on account of its three much frequented pilgrimage shrines (**Puri, Gaya,** and Deoghar). Besides the ordinary prophylactic measures the experiment of inoculating cholera contacts with anti-cholera vaccine was tried at Hurhuru in Hazaribagh district; 535 persons were inoculated, 8 were attacked within 18 hours, and 19 from 2 to 10 days after inoculation. Excluding the 8 (who must have been already infected before inoculation) the incidence after one injection was 3·5 per cent., compared to 12·0 previous to inoculation, and the mortality 42 per cent., against 62 per cent. A second injection was given to 433 persons, and amongst these not a single case occurred: while of 124 not inoculated, 24 were attacked and 14 died—i.e., 19·0 per cent. in incidence and 58 per cent. case-mortality. Out of 178,034 coolies recruited by the Tea Districts Labour Association 134,606 were inoculated without any untoward effects. There was less plague (0·4 deaths per 1000, compared with 1·5 in 1918 and 1·2 in the quinquennium). The small town of Tikari, in Gaya district, had 39 deaths (6·6 per 1000). It is very satisfactory to learn that the Temple authorities at Puri gave willing coöperation in disinfecting wells inside the temple and the sacred tanks at the time of the Rathjathra festival in July, when cholera was epidemic in the surrounding districts. This was done, Dr. Tiwari believes, "for the first time in the history of sanitary arrangements at Puri," and is a testimony to the care and tact of the sanitary authorities concerned. Improvements have been carried out in the drainage and general sanitation of the "New Capital," Patna; and in this connexion Mr. J. G. Alexander, officiating sanitary engineer, states that the year under review has been one of marked activity. The use of flat graded sewers to take the effluent from small septic tanks "has been found to be thoroughly justified in practice," and "augurs well for the success of the whole scheme designed on this principle."

### *Hospitals and Dispensaries.*

In his report on hospitals and dispensaries[2] in Bihar and Orissa for the years 1917–19 Lieut.-Colonel H. Austen Smith, C.I.E., Inspector-General of Civil Hospitals, points out that the provision of dispensaries, even if extended (as is now being done), only partly meets the needs of the population, leaving the rural areas to some extent untouched. He advocates the extended use of travelling dispensaries, adequately equipped, while the assistant surgeon in charge would give advice regarding sanitation, investigate local outbreaks of disease, and generally help the people from a medical point of view. There were 20 travelling dispensaries in the province at the beginning of the triennium and 15 at its close, the average number of patients treated yearly being 76,365. The total number of indoor patients treated in all classes of hospitals and dispensaries was 65,319 in 1919, compared with 50,625 in 1916; the corresponding numbers of out-patients were 3,663,677 and 3,412,520. A large increase occurred in the death-rate of dispensary in-patients (5·68 per cent. in 1917, 7·20 in 1918, and 10·06 in 1919), partly due to general unhealthiness in some districts, and partly to be explained by the fact that over 6 per cent. were moribund on admission. Malaria was excessively prevalent, the yearly average of cases treated at hospitals and dispensaries having been 765,435, compared with 609,001 in the preceding triennium. The benefits of quinine are appreciated by the people, the amounts realised from its sale (in the form of pills and influenza tablets) having been Rs. 23,534, Rs. 29,202, and Rs. 26,920 in the three years, 1917–19 respectively. Lieut.-Colonel J. C. S. Vaughan, I.M.S., has ascertained that *Vitex peduncularis* (a plant largely used in Madagascar in the treatment of malaria and blackwater fever) is indigenous in the Ranchi district, and in use by the aboriginal tribes as a remedy for these affections. Good results have been obtained by treatment with infusions of the leaf, and further investigations are in progress. There was an increase of 7503 patients treated for venereal disease in 1917–19 over the preceding triennial period. This was apparently due to the increased number of syphilitic patients attending, since treatment by novarsenobillon injections has been adopted with considerable success. An additional leper asylum has been established at Cuttack, with accommodation for 232 patients. Radium therapy for cancer, keloids, &c., was undertaken by Lieut.-Colonel Vaughan at Bhagalpur in 1913, and has been continued by him at Ranchi with good results. The demand for this treatment is rapidly increasing, and it is proposed to establish a radium institute at this station, which is conveniently near Calcutta, and has a suitable climate.

### *Sickness and Mortality in Jails.*

From the report on the jails[3] in Bihar and Orissa, in 1919 it appears that 9026 prisoners were present at the beginning of the year, and that the total number of prisoners of all classes received was 59,835, being an increase of 17,279 on the corresponding figure for 1918. The total number under care was therefore 68,681, and the daily average prison population 9763, compared with 9199 in the year preceding. Major W. Gillitt, C.I.E., I.M.S., officiating inspector-general of prisons, states that this increase "was doubtless due to the prevalence of acute scarcity throughout the province," leading to an increase in offences against property. Crimes against the person have shown an appreciable decline. The number of females convicted was more than double that in the previous year. There was consequently over-

[1] Annual Sanitary Report on the Province of Bihar and Orissa for 1919. By S. N. Tiwari, D.P.H., officiating sanitary commissioner, and J. G. Alexander, officiating sanitary engineer. Patna, 1920.

[2] Patna, 1920. [3] Administration Report for 1919. Patna, 1920.

crowding; but nevertheless there was a marked decrease in the sickness and death-rates of the prisoners. The ratios of admission to hospital (1222·2 per 1000), daily average sick (48·0), and the deaths (43·6) were all considerably lower than in 1918, when these ratios had been 1497·5, 71·9, and 63·4 respectively. These figures afford a most striking testimony to the skill and care of the officers in charge of these institutions and their staff. The mortality was high at Angul (158·9), Hazaribagh (127·6), and Balasore (126·2), dysentery being the chief reason for the excess in each case. For the province as a whole malarial fever caused most admissions (304·6 per 1000), but only 1·0 per 1000 were fatal. Dysentery caused 193·2 per 1000 admissions and 15·8 deaths; diarrhœa, 150·4 admissions and 3·3 deaths. For pneumonia the ratios were only 9·6 and 3·5, as compared with 21·0 and 4·9 in 1918. An interesting table (No. XVII.) gives details as to death-rates for convicts in 1919, according to length of sojourn in jail. For six months or less the ratio was 65·9 per 1000; from six months to a year, 44·4; from one to two years, 30·3; from two to three years, 21·4; from three to seven years, 35·7; and above seven years, 3·2.

## THE SUICIDE-RATE AND NATIONAL PROSPERITY.

ACCORDING to the August number of the *Statistical Bulletin* of the Metropolitan Life Insurance Co., there are indications that the downward trend in the suicide death-rate in the U.S.A. has received a check this year. During the first seven months of 1921, the rate from suicide among more than 13 million industrial policyholders was 7·3 per 100,000, which is an increase of 26 per cent. over the rate for the corresponding period of 1920. Other observers have noted the same facts in different fields. The National Committee for Mental Hygiene has called attention to the marked increase in the number of suicides, especially among ex-soldiers and others in the general population.

The American suicide-rates of the past ten years present some interesting characteristics. During the period 1911 to 1915, preceding the period of intense industrial activity during the war, only slight changes in the suicide death-rate are to be found. The second period, beginning with 1915, is that of the war years of great economic expansion and increased prosperity for the great body of the American people. Every year, both among the insured and the general population, recorded marked declines in the suicide-rate. In 1920 the rate among insured wage-earners was less than one-half what it had been in 1911. In the later months of 1920 a change seems to have set in which has continued throughout the first seven months of 1921. Month after month the suicide-rate is mounting over the corresponding figures for the months of 1920, and it is likely that the rate for the whole year will be higher than for the preceding one. It would be interesting to know to what degree the unemployment situation of the last year is responsible for the observed conditions as to suicide; suicide-rates may prove to be a sensitive index of the prevailing economic well-being of a people.

## A STATE INSTITUTE OF HYGIENE IN PRAGUE.

A CONTRACT between the International Health Board of the Rockefeller Foundation and the Czecho-Slovak Ministry of Public Health and Physical Education has just been signed, by which a gift of 27,000,000 Cz. crowns has been accepted by the Czecho-Slovak Government for the erection of a State Institute of Hygiene, the Government agreeing to expend an additional 23,000,000 crowns for the project. Such an institution has been projected since the creation of the Ministry; it was conceived as a central public health laboratory, a school for health officers and sanitary personnel, and a research institution which would furnish a scientific background for the activities of the Ministry and save it from becoming a bureaucratic paper office.

When the budget for the Institute was made and was found to reach the sum of 50,000,000 Cz. crowns, it was felt that the strict economy made necessary by post-war conditions would not permit the realisation of this magnificent project. Later the Rockefeller Foundation's representatives, Colonel Frederic F. Russell and Prof. Selskar M. Gunn, came to Prague and the plan was presented to them and finally, with their recommendations, submitted to the International Health Board in New York. The land for the Institute has already been purchased and is located on both sides of a large hospital in Vinohrady, a suburb of Prague. It is one of the best and most modern hospitals of the capital and houses some of the teaching clinics of the Prague Medical Faculty. The close connexion between hospital and laboratories will be of advantage to both, giving excellent opportunities for research and teaching.

*Plans for the Institute.*

Plans have been made and agreed upon by both sides for a central large building and a smaller one. Stables, a power plant, a sewage purification plant, and houses for the personnel are included in the plans. The Institute will consist of several departments. The department for the production of small-pox vaccine and sera will be located in the small building which will also contain the department for Pasteur treatment for rabies. Patients requiring this treatment will be housed temporarily in the hospital, where two pavilions will be built for them. Later on those pavilions will be used for the contagious disease and gynæcological services of the hospital. The main building will have three stories: it will include a central diagnostic laboratory; the department for the control of foods, the department for the control of drugs, and finally, the department for research in hygiene. This last department will contain sections for school hygiene, an experimental station for water purification and sewage disposal, and departments for industrial hygiene and housing; the school for the training of health officers and sanitary personnel will be attached. The Institute will be entirely distinct from the medical faculty and will be administered by a board of directors made up in part from the prominent laboratory men of the country. Some of the future heads of departments have been already selected and sent to the United States at the expense of the Rockefeller Foundation for post-graduate study.

# Medical Diary.

## LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

NORTH-EAST LONDON POST-GRADUATE COLLEGE, Prince of Wales's General Hospital, Tottenham, N.
Special Intensive Course.

MONDAY, Sept. 26th.—4.30 P.M., Clinical Lecture:—Mr. C. J. Bond: Latent Infections (lantern).
TUESDAY.—4.30 P.M., Dr. F. G. Crookshank: Colon Bacillus Infections.
WEDNESDAY.—4.30 P.M., Mr. J. Berry: The Differential Diagnosis of Thyroid Swellings.
THURSDAY.—4.30 P.M., Colonel L. W. Harrison: The Routine Treatment of Syphilis and Tests of Cure in Gonorrhœa and Syphilis.
FRIDAY.—4.30 P.M., Mr. H. W. Carson: Intussusception.
SATURDAY, 11 A.M., Dr. J. Macarthur (at the L.C.C. Mental Hospital, New Southgate, N.): Cases illustrating Emergencies in Mental Medicine.
Daily:—10.30 A.M. and 11.45 A.M., Demonstrations of Clinical and Laboratory Methods. 2 P.M., Demonstration of Groups of Clinical Cases. 3 P.M.: General Hospital Work. 4.30 P.M., Clinical Lecture (free to Medical Practitioners).

WEST LONDON POST-GRADUATE COLLEGE, West London Hospital, Hammersmith, W.

MONDAY, Sept. 26th.—2 P.M., Dr. S. Pinchin: Medical Out-patients. Dr. Simson: Diseases of Women. Mr. MacDonald: Surgical Out-patients. 2.30 P.M., Mr. T. Gray: Visit to Surgical Wards.
TUESDAY.—10 A.M., Mr. Steadman: Dental Department. 2 P.M., Dr. Burrell: Medical Out-patients. Mr. T. Gray: Surgical Out-patients. 2.30 P.M., Mr. Addison: Visit to Surgical Wards.
WEDNESDAY.—10 A.M., Mr. MacDonald: Genito-Urinary Department. 2 P.M., Mr. Addison: Operations. Mr. Gibb: Eye Department. Mr. D. Armour: Visit to Surgical Wards.
THURSDAY.—2 P.M., Mr. D. Armour: Operations. Mr. B. Harman: Eye Department.
FRIDAY.—10 A.M., Mr. D. Buxton: Dental Department. 2.30 P.M., Dr. Pritchard: Visit to Medical Wards.
SATURDAY.—10 A.M., Dr. Burnford: Visit to Medical Wards. 2 P.M., Dr. Owen: Medical Out-patients. Mr. Sinclair: Surgical Out-patients.
Daily: 10 A.M., Visit of Post-Graduates to Wards. 2 P.M., In-patient, Out-patient Clinics and Operations.


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